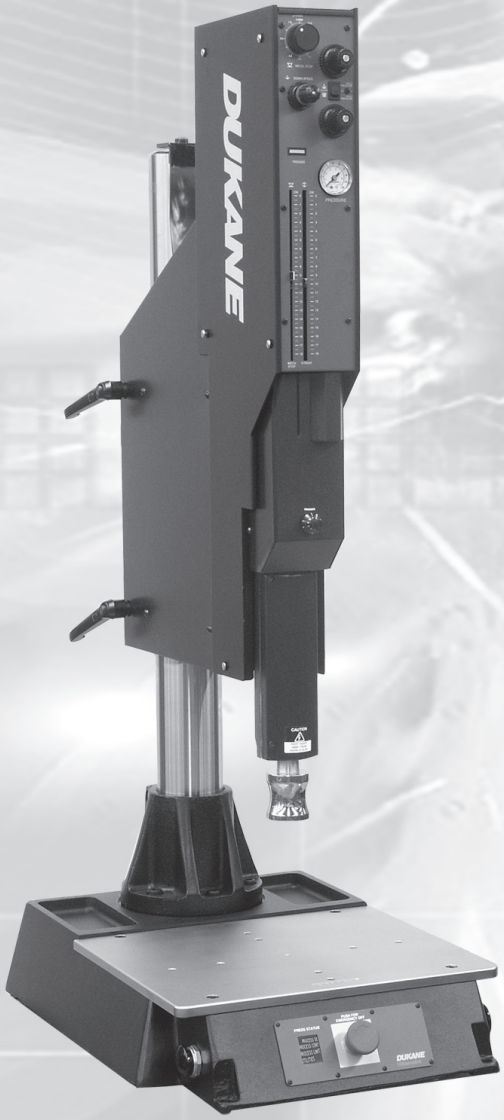
DUKANE

Intelligent Assembly Solutions

Model 220
20kHz Press/Thruster



Model 340
30/40kHz Press/Thruster

User's Manual

Dukane Part No. 403–556-03

Dukane Intelligent Assembly Solutions • 2900 Dukane Drive • St. Charles, Illinois 60174 USA • TEL (630) 797–4900 • FAX (630) 797–4949

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Dukane Intelligent Assembly Solutions
2900 Dukane Drive
St. Charles, IL 60174 USA

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Addendum 1	Revise drawings in Section 1 Specifications – Page 3	2001–Sep–20
–01	Update telephone numbers on covers and in Section 11 Revise Replacement Part List in Section 11 Update Mechanical, Pneumatic and Electrical schematics	2004–Jun–08
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–03	Corrected Revision 03: Corrected numerous spelling and grammatical errors. Also corrected torque values, and testing the stack procedures.	2007- Aug - 08

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SECTION 1

Introduction

- This section gives a general introduction to the press, and deals with safety considerations.

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About This Manual

This manual provides information to set up, operate, and interface Dukane's model 220 20kHz Press/Thruster. The manual consists of sections that describe in detail press specifications and functions, installation and testing procedures, and maintenance and troubleshooting steps. Each section describes all of the press functions that are applicable to a standard press/thruster.

Note that the manual covers the Model 220 & Model 340 Press/Thruster only. Refer to the user manual for the Dynamic Process Controller™ (DPC) for additional information regarding safety, connections, and programming for the entire assembly system.

Safety

Safety Recommendations

Your safety is important!
This symbol warns you of any hazard or unsafe practice that could result in personal injury or equipment damage. Carefully read and observe all cautions and warnings that appear in this manual.

To operate the equipment in a safe and efficient manner and avoid possible injury, please observe the following safety measures:

- Do not operate the system before it is properly installed.
- Any unauthorized modifications to the control circuitry or other parts of the system could cause damage to the equipment and/or injury to the operator.
- Do not operate this equipment without a grounded connection.
- Accessories may be required for compliance with applicable OSHA regulations for machine guarding and noise exposure.

- When ultrasonic plastic assembly equipment is used with automatic material handling equipment as an automated system, a SYSTEM ABORT switch should be located at each operator station.
- Use of a foot switch in place of dual palm buttons violates OSHA regulations.
- DO NOT touch the horn tip when the system is operating. Touching a horn tip that is vibrating at ultrasonic frequencies can result in serious injury.
- The operator's head should be kept at least six (6) inches away from the horn and transducer during the system operation.
- At times, parts being ultrasonically joined may vibrate at frequencies that are audible to the human ear. Ear protectors may be worn to reduce annoyance or discomfort from the resulting high-pitched sound. Ultrasound baffles, sound enclosures, or acoustical absorbing materials may also be located in the vicinity of the system to reduce the level of high-frequency sounds.
- A system using pre-trigger must be adjusted so that the ultrasound will not fire when the horn is any further than 1/4 inch away from the part to ensure safe operation. This is because the pre-trigger switch option starts the horn vibrating before it contacts the part.
- Do not wear loose clothing or jewelry as they can become caught in moving parts.
- Use eye protection. Wear ANSI approved safety impact goggles.
- Stay alert and watch what you are doing at all times. Use common sense. Do not operate the press when you are tired or distracted from the job at hand.
- Do not operate the press if under the influence of alcohol or drugs. Read the warning labels on prescriptions to determine if your judgement or reflexes are impaired while taking drugs. If there is any doubt, do not operate the machine.

Other safety recommendations are included in the manual where they apply.

Special Health Notice – Plastics

Certain plastic materials, when being processed, may emit fumes and/or gases that may be hazardous to the operator's health. Proper ventilation of the work station should be provided where such materials are processed. Inquiries should be made to the U.S. Department of Labor concerning OSHA regulations for a particular plastic prior to processing with Dukane ultrasonic equipment.

Electrical Safety Grounding

The Dynamic Process Controller (DPC) provides the operating power and power returns: Refer to the DPC manual for full information regarding electrical grounding and safety. In addition to the safety considerations, proper grounding is essential for the effective suppression of RFI (Radio Frequency Interference). Every DPC contains a RFI filter which blocks noise on the AC power line from entering the DPC control circuitry. This filter also prevents ultrasonic RFI from being fed back into the AC power line. If you experience problems with RFI from the press, run an additional grounding wire from the press base grounding stud (see Figure 2-6) to the nearest grounded metal pipe or equivalent earth ground by means of a ground clamp. Use at least 14 AWG wire for the connection to the press base.

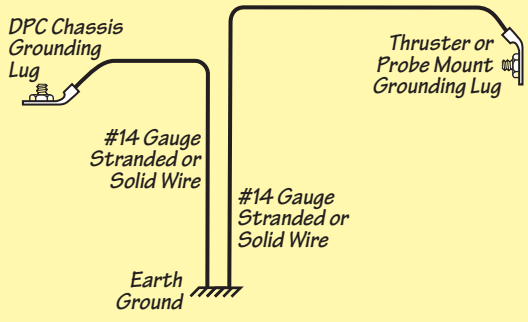
CAUTION

If there is any question about the grounding of your receptacle, have it checked by a qualified electrician. Do not cut off the power cord grounding prong, or alter the plug in any way. If an extension cord is needed, use a three-wire cord that is in good condition. The cord should have an adequate power rating to do the job safely. It must be plugged into a grounded receptacle. Do not use a two-wire extension cord with this product.

CAUTION

To ensure safe and trouble–free operation, ground the DPC chassis and the press/thruster.

Use a *STAR* configuration (illustrated below). Do not *DAISY CHAIN* the grounds.


DPC Chassis Grounding Lug
Thruster or Probe Mount Grounding Lug
#14 Gauge Stranded or Solid Wire
#14 Gauge Stranded or Solid Wire
Earth Ground

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SECTION 2

Installation

- This section explains the proper machine placement and adjustments, and the cable connections of the press/thruster.

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Installing the Press System

The press system consists of a thruster, ergonomic base and support package. It is assembled at the factory for shipment.

Unpacking

The press system is secured to a wooden pallet and covered with a cardboard carton. The press sits on the pallet and is supported inside the carton by styrofoam blocks.

1. Before unpacking, it is suggested that the press be moved close to the location where it is to be installed.
2. Remove the straps from the carton.
3. Open the carton and remove the packing material and the cables.
4. Cut the tape located at the bottom corners and unfold the flaps.
5. Remove the carton, as shown in **Figure 2-1**, leaving the press on the shipping base.
6. Inspect the assembly for any possible damage before placing it in position.

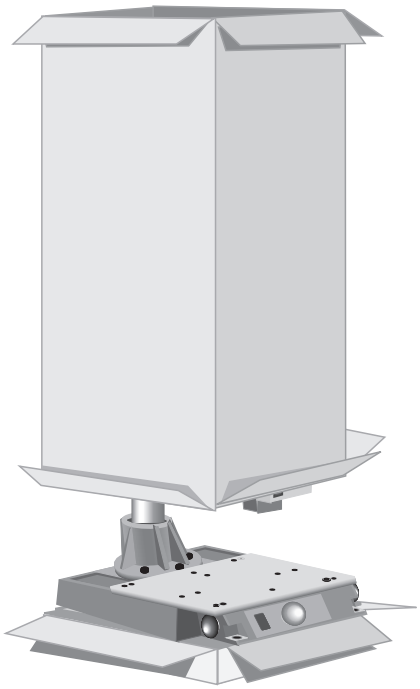


Figure 2-1 *Unpacking Press System*

Placement

DO NOT LIFT the Press manually. Lifting and/or moving the Press manually could result in personal injury. Use mechanical means to move and place the Press.

The placement of the press system should be by mechanical means.

To place the press on the work area, use a pallet lift platform or equivalent. Raise the assembly until the bottom edge of the base is even with the top of the work area as shown in **Figure 2-2**. Then, carefully slide the press system on to the work area.

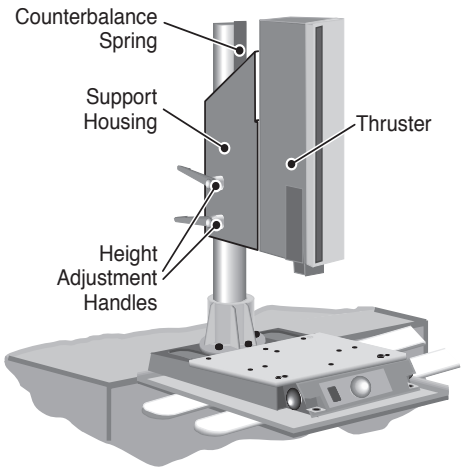


Figure 2-2 *Example of Press Placement*

Installing the Press System Without Machine Base

In this configuration, secure the flange to a rigid, level stationary structure. We recommend socket-head cap screws M12 -1.75 with a minimum length of 40 mm for securing the flange to the supporting structure. We recommend a minimum of 1 inch (25.4 mm) full thread engagement of the cap screws into the supporting structure. Depending upon the thickness and material of the supporting structure, longer screws and/or additional hardware may be required.

A full scale template is provided for locating and drilling holes in the supporting structure. The template is on the last page of this section.

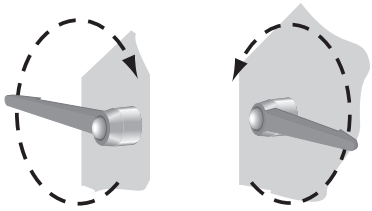
Press Height Adjustment

The height of the thruster on the column is adjustable. Adjustment is made by first turning the two handles located on the left rear side of the press.

- To loosen the grip on the column, turn the handles counterclockwise, as shown in **Figure 2-3a**. The counterbalance spring on the column supports the weight of the thruster while the handles are loose. If a thruster is not installed, the unloaded column may rise up unexpectedly, so be careful to avoid injury.
- Adjust the column to the desired height.
- Turn the handles clockwise, as shown in **Figure 2-3b**, until tight.
- To rotate the handles out of the way without loosening or tightening, pull the handles outward, rotate and release, as shown in **Figure 2-4**.

CAUTION

Exercise caution if a thruster is not installed on the support housing. The counterbalance spring on the unloaded housing may cause the assembly to rise up unexpectedly when the height adjustment handles are loosened.



(a) *– Loosen* ***(B)*** *– Tighten*

Figure 2-3 *To Make Adjustments*

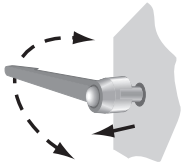


Figure 2-4 *To Relocate Handles*

Installing the Thruster

Secure the thruster to a rigid stationary structure by placing the back of the thruster onto the support frame. Align the bolt holes in the thruster with the bolt slots in the support frame. Insert the two mounting bolts (3/8-16 x 1-1/4 inch hexhead or equivalent), with flat washers, as shown in **Figure 2-5**. Align the thruster with the work surface in both the horizontal and vertical planes to assure parallelism. Tighten the bolts.

When mounted to a Dukane column as in the press configuration, the height of the thruster is adjustable on the column. If the height of the thruster is not adjustable in your mounting arrangement, you must consider the distance from the horn tip to the work surface when determining the position of the thruster.

The distance between the tip of the retracted horn and the parts in the fixture must be less than the maximum travelling distance (stroke) of the thruster slide assembly. If greater, the horn will be unable to contact the parts during operation. The maximum stroke distance is 177.8 mm (7 inches).

A shorter distance between the retracted horn tip and the parts in the fixture means a shorter travelling distance (stroke) during operation which results in two advantages:

- A more stable thruster when applying pressure to the parts
- A shorter duty cycle for a faster production rate

However, make certain, that there is sufficient room for the placement and removal of parts.

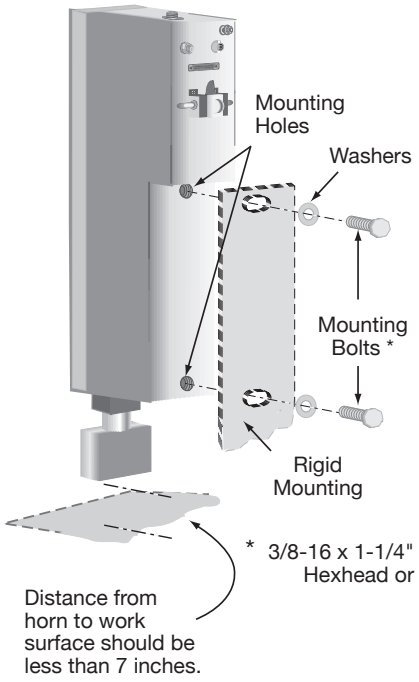

Mounting Holes
Washers
Mounting Bolts *
Rigid Mounting
* 3/8-16 x 1-1/4" Hexhead or
Distance from horn to work surface should be less than 7 inches.

Figure 2-5 *Example of Mounting the Thruster to a Rigid Structure*

Cable Connections

Press System

The press is not equipped with its own source of compressed air, electrical power, or electrical control and monitoring. These functions are provided through the connectors located on the rear of the thruster (Refer to **Figure 2-6**):

- **Top of Stroke (J40**) - This receptacle is factory wired to a switch in the press/thruster that opens when the press/thruster slide assembly begins extending and closes when the slide assembly returns to the fully retracted (i.e. top-of-stroke) position. This contact closure is typically used in automated systems to indicate to the controlling mechanism when the slide assembly is fully retracted. A Dukane cable (model number 438-528) mates with this receptacle to allow access to the switch contacts.

  Note: Under normal usage, it is recommended that the voltage applied to the contacts does not exceed 24 VDC @ 2 amps.

- **Ultrasound (J1**) - This input connects the transducer to the Ultrasound Output of the Dynamic Processor Control (DPC), through a coaxial cable. The electrical welding signal is transmitted through this cable.

- **Operational control (J7)** - Connects the press functions to the Press Port (J201), located in the DPC. Through this cable the DPC provides controls for triggering of the weld, operation of the thruster's pneumatic system, and 24 VDC operating voltage. The press driver card in the DPC also provides monitoring for these functions.

- **Air in** - This is a threaded receptacle for a compressed air supply that provides the thruster with the required pressure of 10-100 psi (1-7 atmospheres) to operate the pneumatic system.

  This connector is attached to an air filter on the press. The input to the filter comes from the air shut-off valve, located on the back, near the bottom of the press.

- **Encoder (Optional)** - The purpose of the encoder cable is to connect the distance encoder option to the DPC Distance Port (J401). For details on the Encoder see Section 4: *Press Options*.

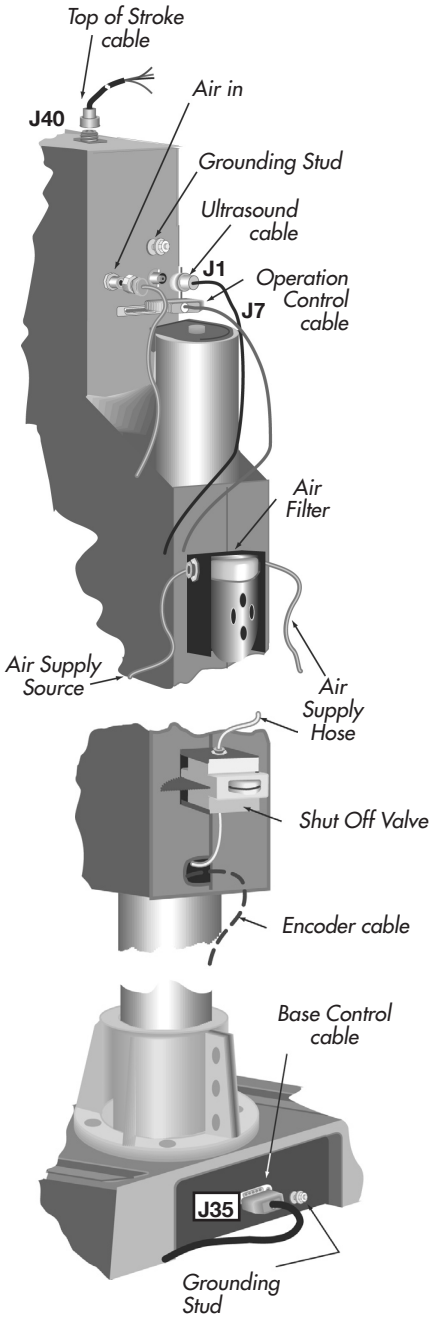


Figure 2-6 *Press Connector Locations*

- **Ergonomic Base (J35)** - Connects the base controls and display to the Press Base Port (J202) on the DPC.

The press system requires three cables for proper operation. These cables are part of the cable package that is shipped with the press. A customer-provided air hose (5/16 inch dia.) is also required.

Connect the following lines and cables to the press system:

- Connect the ultrasound coaxial cable to J1 on the thruster.

  DO NOT run the generator unless this cable is connected and the transducer is installed in the thruster — Otherwise, an overload condition could occur, with possible damage to the generator.

- Connect the operational control cable to J7 on the thruster.

- Connect clean, dry air from an air source to the fitting located at the lower portion of the support package.

  Figure 2-6 shows the locations of the connections.

- Encoder cable (optional) - If the press is equipped with an encoder, the cable will already be wired in.

- Connect 9-pin ergonomic base cable to J35 on the back of the base

.

CAUTION

The compressed air for the thruster must be clean, dry and oil free. Any particulate, oil contamination or moisture can coat or clog the valves, sensors and cylinder walls. This can result in premature failure of the regulator, pressure transducer, air cylinder or other componets of the pneumatic system.

Thruster Only

For thrusters, the only required connections are the air line, ultrasound cable, and the operational control cable. All the connections are located on the back of the thruster. **Figure 2-7** shows the location of the connections.

Because the thruster does not use a support package, the air source is connected directly to the "Air In" fitting.

In both press system and thruster-only configurations, the other ends of the cables are connected to the Dynamic Process Controller (DPC).

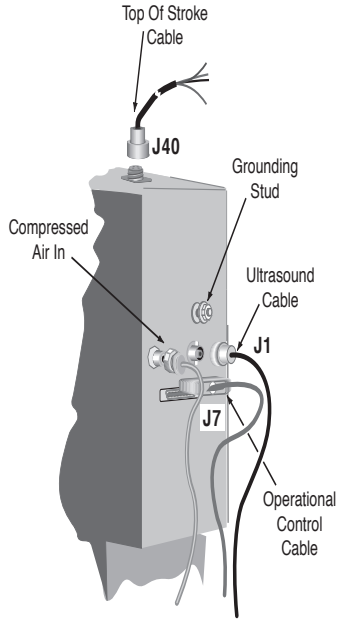


Figure 2-7 *Thruster Connector Locations*

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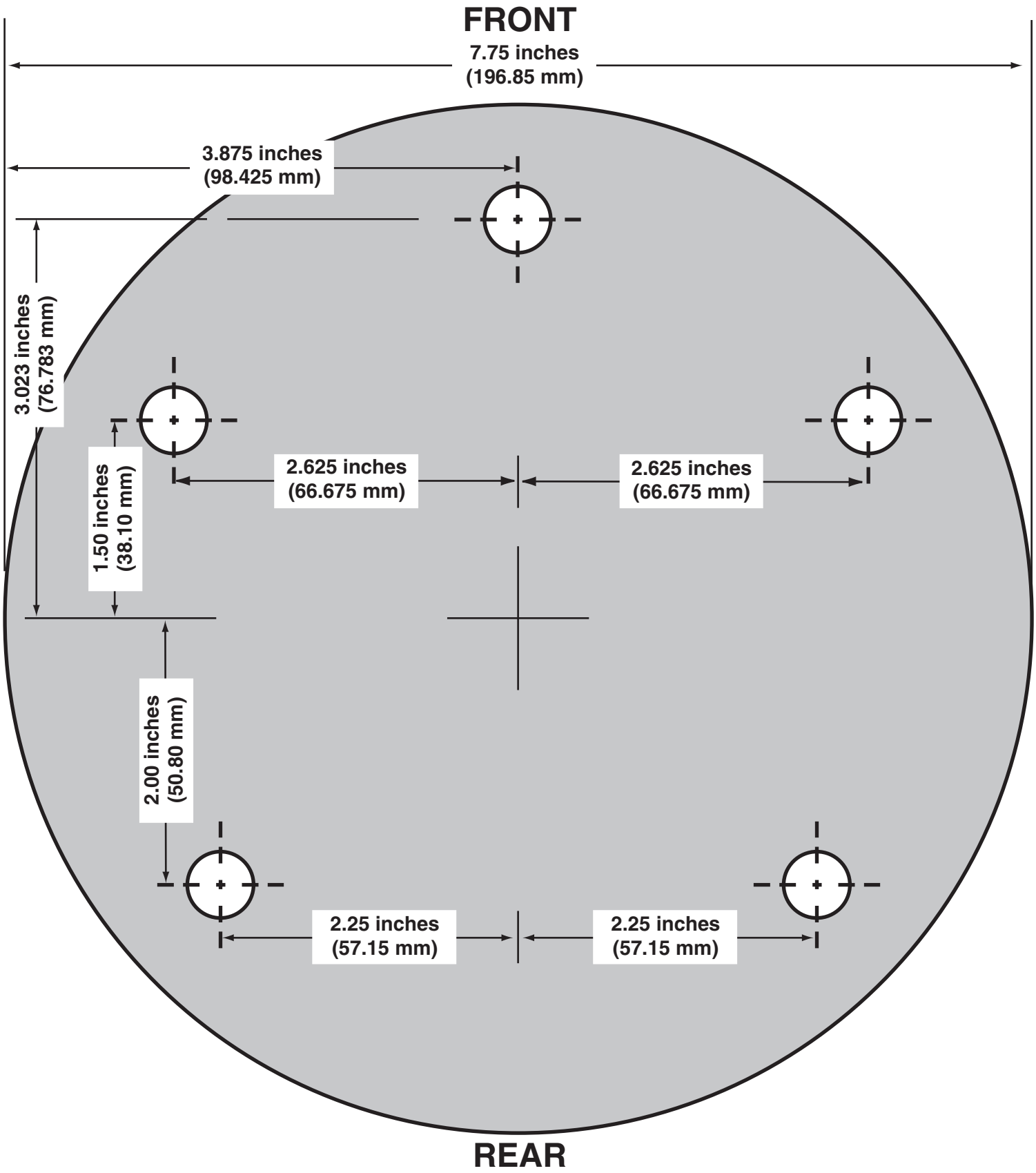

Flange Template

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SECTION 3

Control Description

- This section describes the arrangement and functions of all the press controls and indicators on the system.

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Overview

This section describes the controls, indicators and features for the manual and electronic pressure-regulated (EPR) versions of the Press/Thruster System.

The controls on the front of the thruster can be used to manually set the parameters for a given process.

The indicators associated with the controls provide a visual indication of the control settings.

The features used on the control panel are:

- Metric measurements
- International symbols to assist in locating the proper controls and their associated indicators. Refer to **Table 3-1**.

Symbol	Reference	Symbol	Reference
	Mechanical Stop		Weld Pressure
	Down Speed		End of Weld
	Thruster Stroke		Hold
	Slow Speed		Direction

Table 3-1 *Thruster Symbols*

Manual Controls

Refer to **Figure 3-1** for the location of the controls.

Down Speed Adjustment

This control adjusts the downward velocity of the press/thruster slide assembly. Turning the knob clockwise decreases the speed. Turning it counterclockwise increases the speed of descent.

Hydraulic Slow Speed Control (optional)

This control is used to adjust the point in the down stroke where the hydraulic speed damper is engaged. The SLOW SPEED Control knob adjusts to a point along the 7 inch (177.8 mm) of total available downstroke distance that the hydraulic Speed Control engages. Refer to Section 4: *Press Options*, for detailed information on the Hydraulic Slow Speed Control.

Hydraulic Slow Speed Adjustment

The Hydraulic slow speed adjustment is an integral part of the optional hydraulic slow speed control. It sets the amount of velocity damping of the hydraulic unit. For detailed information on this adjustment, refer to Section 4: *Press Options.*

Mechanical Stop Adjustment

The function of the mechanical stop is to halt the down stroke at a predetermined point. It is used in two ways:

- To stop the down stroke at a particular depth of travel relative to the fixture/anvil
- To prevent the horn from contacting the fixture when there is no part present. This prevents possible damage to the horn and/or fixture. Never allow the horn to contact the fixture while ultrasonic power is applied to the horn. Metal–to–metal contact can void the horn and/or tooling warranty.

CAUTION

Do not allow the horn to contact the fixture while ultrasonic power is applied to the horn.

Metal–to–metal contact can void the horn and/or tooling warranty.

Pressure 1 Regulator

Pressure 1 regulator is used to set the amount of air pressure applied to the air cylinder during the press down stroke and weld cycle.

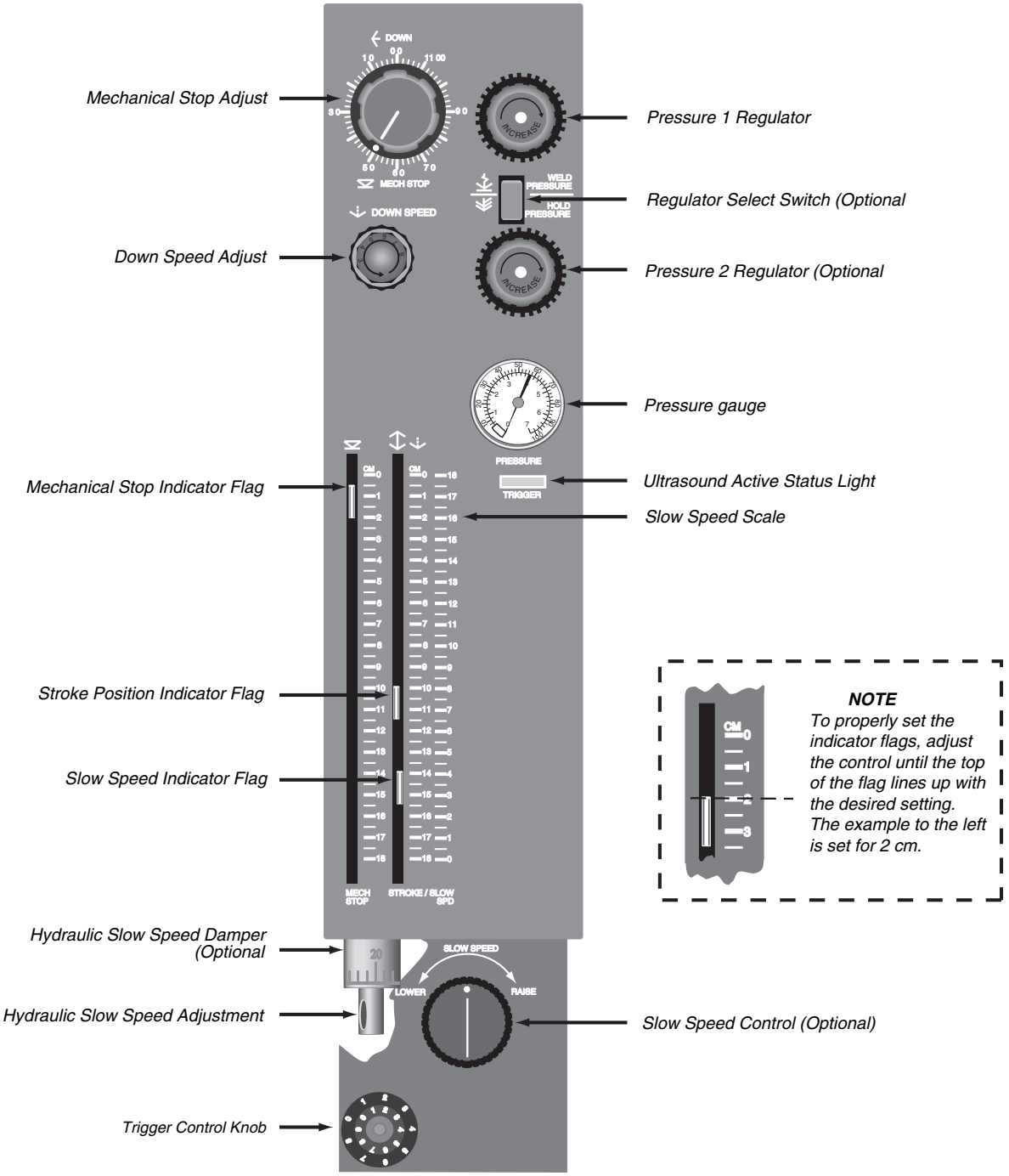

Figure 3-1 *(Manual) Press/Thruster Controls and Indicator Locations*

Pressure 2 Regulator

In applications where welding with dual pressure is required, this pressure regulator would be set to provide a higher pressure during a portion of the weld cycle. This pressure is also maintained during the hold time.

Note: The actual amount of force applied to the part depends on the following four factors:

- The setting of the regulator(s)
- The area of the air cylinder
- The mass of the horn used
- The surface area of the horn

Regulator Select Switch (Optional)

The Regulator Select switch is used to select Pressure 1 regulator (Weld Pressure) or Pressure 2 regulator (Hold Pressure) to set the required pressure on each regulator and for monitoring the pressure gauge.

Pre-Trigger Control (Optional)

The pre-trigger control turns the ultrasound on at a preset point in the thruster downstroke. This control is normally used in staking and inserting applications. This control should be set for a distance of approximately 6.25 mm (.25 inch) above the part.

Trigger Control

Setting the trigger control determines the amount of pre-load on the part before turning on the ultrasonics.

End-of-Weld Control (Optional)

This adjustment is set at the point in the stroke of horn travel (absolute distance) where the ultrasound turns off.

Indicators

Pressure Gauge

The pressure gauge shows the amount of air pressure applied to the upper portion of the air cylinder for the weld-and-hold operation.

Ultrasound Active Status Light

This LED indicator lights up when the generator is applying ultrasonic power to the horn.

Stroke Position Indicator Flag

The stroke position indicator flag is not preset prior to press operation. It moves with the slide assembly as the assembly moves down and up.

Mechanical Stop Indicator Flag

This setting indicates where the downstroke will end.

Slow Speed Indicator Flag (Optional)

This indicator flag is set by the Slow Speed control. It is included as part of the Slow Speed Control option. When set, it indicates the point in the downstroke where the plunger on the hydraulic speed control is engaged.

Electronic Pressure Regulator

Refer to **Figure 3-2** for the location of the controls.

The EPR (Electronic Pressure Regulator) option deletes the Pressure 1 and Pressure 2 Regulators and the Regulator Select Switch found on the manual press, and replaces them with the following:

- Electronic Pressure Regulator (EPR) that controls the pneumatic pressure on command from the DPC IV.

- A pressure transducer that functions as the pressure gauge in that it converts pneumatic pressure into an electrical signal for the DPC IV to use for feedback control.

  and optionally–

- A load cell that measures applied force. A force transducer converts the mechanical force applied to the parts into an electrical signal. This allows the DPC IV to trigger by force.

Note that this option is only functional when used with a DPC IV or DPC IV Plus. Refer to Section 4: *Press Options*, for detailed information.

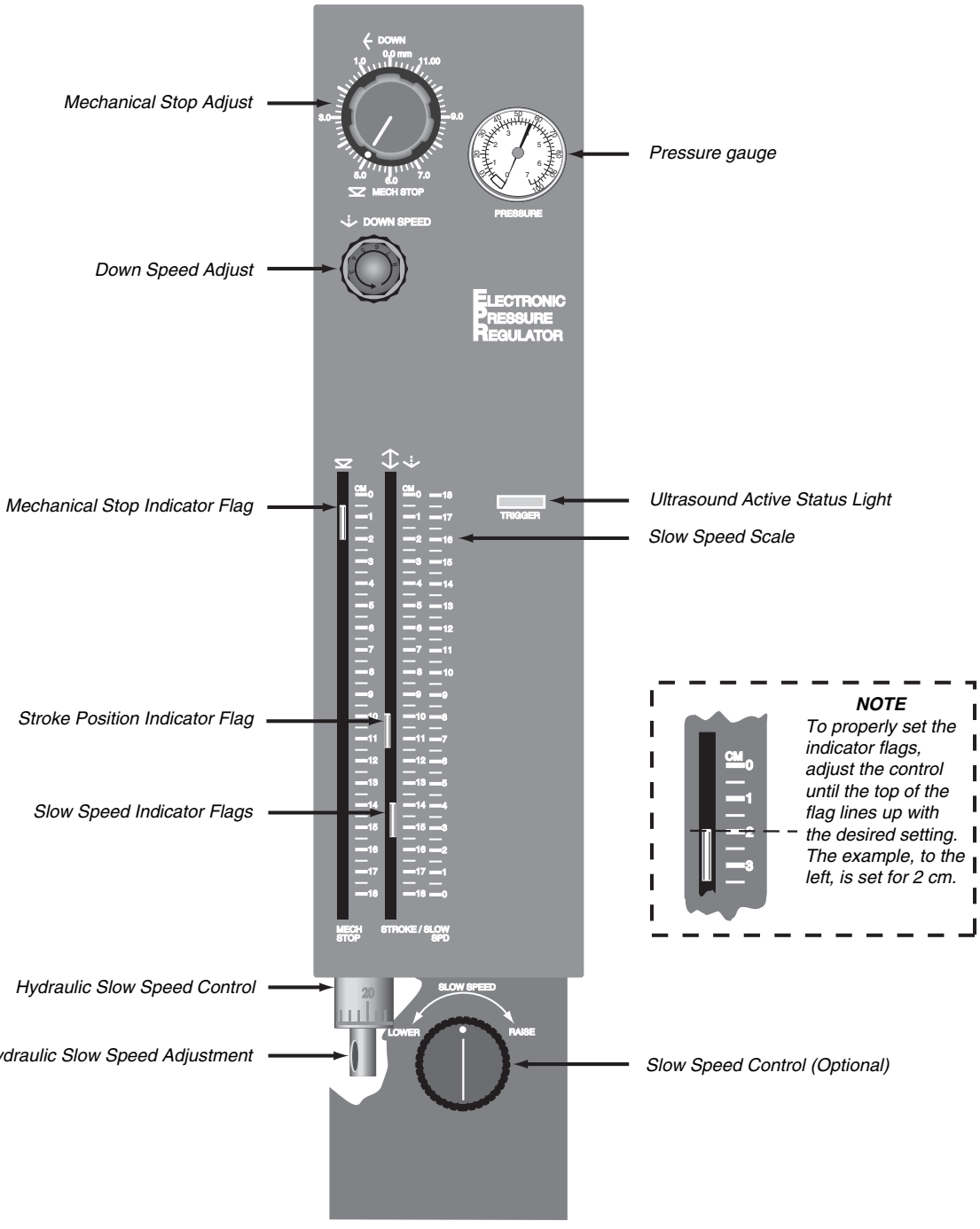

Figure 3-2 *(EPR) Press/Thruster Controls and Indicator Locations*

Ergonomic Base

The ergonomic base, shown in **Figure 3-3**, consists of a base plate, cycle activation switches (black palm switches), abort switch (red palm switch), and a status display screen. At the back of the base is a cable connector for an interface between the DPC and the base front panel.

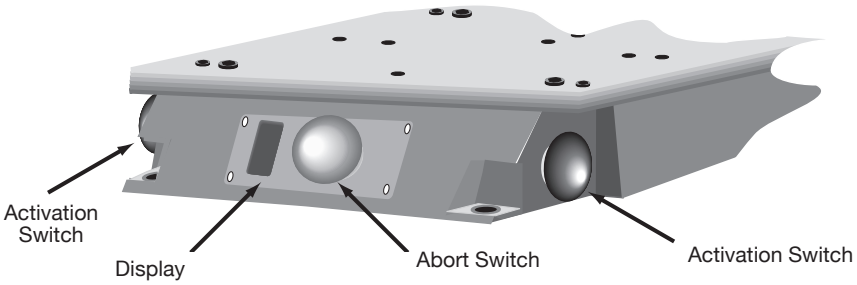

Figure 3-3 *Ergonomic Base Controls*

Base Plate

The machined base plate is bolted to the top of the ergonomic base. It has drilled and tapped holes that line up with leveling screws in the fixtures to allow easy fixture leveling for alignment with the horn. For details on the alignment and leveling of the base plate, see Section 5: *Stack/Fixture Setup*.

Abort Switch

The abort switch applies 24 VDC power to the thruster/press. Pressing the abort switch causes the DPC to:

— Immediately turn off the ultrasound,

— Remove electrical power from the press, and

— Initiate a software abort sequence.

Activation Switches

These two switches must be activated within 350 msec (0.35 sec) of each other and held closed for at least 25 msec to initiate a weld cycle. This is a mandated safety requirement.

Base Status Display

The function of the display is to indicate one of three status conditions of the press:

- **READY** - When the abort switch is pulled out, the green "READY" status light indicates that power is applied to the press and it is ready for operation.

- **ABORT** - When the abort switch is pushed in, the red "ABORT" status indicator illuminates. Press operation is no longer possible.

- **IN CYCLE** - When both activation switches are pressed, the "IN CYCLE" display of the status indicator is ON for the duration of the palm switch activation.

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SECTION 4

Press Options

- This section provides detailed information regarding the installation and operation of the hydraulic speed control (Kinichek), distance encoder, and electronic pressure regulator options.

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Overview

This section provides detailed information for the common options for press/thruster operation. These options are:

- Hydraulic Speed Control
- Distance Encoder
- Electronic Pressure Regulator

Detailed description, installation, and any applicable alignment or adjustments follow.

The optional air cylinders (1.5, 2, and 3 inches in dia.) are factory installed and do not require any field adjustments.

Additional Options

Dukane can provide high-quality automation equipment for efficient handling and assembly of parts. This equipment is tailored specifically to your needs. Some of the available options include pick and place automation, rotary tables, in-line indexing, conveyors, and walking beams. Dukane can also provide standard and custom sound enclosures. The additional options are not covered in this manual due to their specialized applications. Contact your local Dukane representative for more specific information.

Hydraulic Speed Control

SLOW SPEED Control and Indicator Flags

The thruster has a knob labelled "SLOW SPEED" near the bottom of the front panel and an indicator flag in the same slot with the STROKE POSITION indicator flag. Refer to **Figure 4-1**.

The knob and the indicator flag are part of the optional Hydraulic Speed Control Kit.

The purpose of the hydraulic speed control is to match the downstroke speed to the material melt flow. This will produce the strongest joint. The Slow Speed Setting knob adjusts the point along the 7 inch (177.8 mm) downstroke distance at which the hydraulic speed control will engage. It should be set to engage just before the horn contacts the part. The maximum distance over which this kit can control the downstroke speed is 1 inch (25.4 mm).

The top edge of the indicator flag, when referenced to the yellow scale beside the flag slot, shows where the 1 inch (25.4 mm) of slow speed is set to begin.

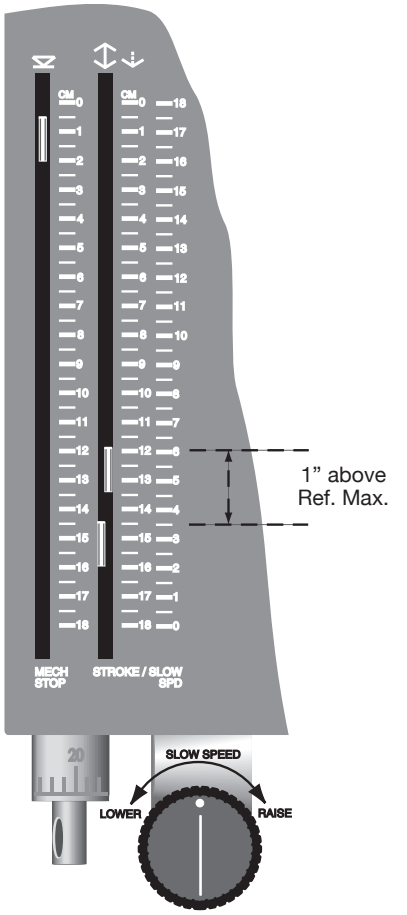

Figure 4-1 *Example of Slow Speed Setting*

Hydraulic Speed Control Kit Operation

The hydraulic speed control kit, shown in **Figure 4-2**, is a combination impact absorber and hydraulic check valve.

The kit contains a sealed hydraulic cylinder with an external plunger. The cylinder is mounted to the stationary part of the thruster.

The kit also has a contact block that is mounted to the slide assembly of the thruster. When the slide assembly descends, the contact block descends until it engages the plunger of the stationary hydraulic cylinder and pushes the plunger down into the cylinder. The design of the cylinder resists the downward motion of the plunger by metering the pure silicone fluid through an adjustable internal flow aperture, resulting in a constant speed of the slide assembly.

The hydraulic cylinder is mounted in a clamping block. The block is threaded onto a long rod.

Turning the SLOW SPEED knob rotates the rod.

This in turn causes the clamping block to ride up or down on the rod, moving the hydraulic cylinder closer to or further from the contact block at rest.

This distance determines how far the contact block, and therefore the slide assembly, must travel before the block contacts the plunger of the hydraulic cylinder.

The plunger has a maximum travelling distance of one inch (25.4 mm). The first 1/4 inch (6.4 mm) of travel decelerates the speed of the slide assembly. The remaining 3/4 inch (19.1 mm) of travel allows the slide assembly to descend at a constant slow speed set by the operator.

The slide assembly can only travel downward a maximum of one inch (25.4 mm) after the block contacts the plunger.

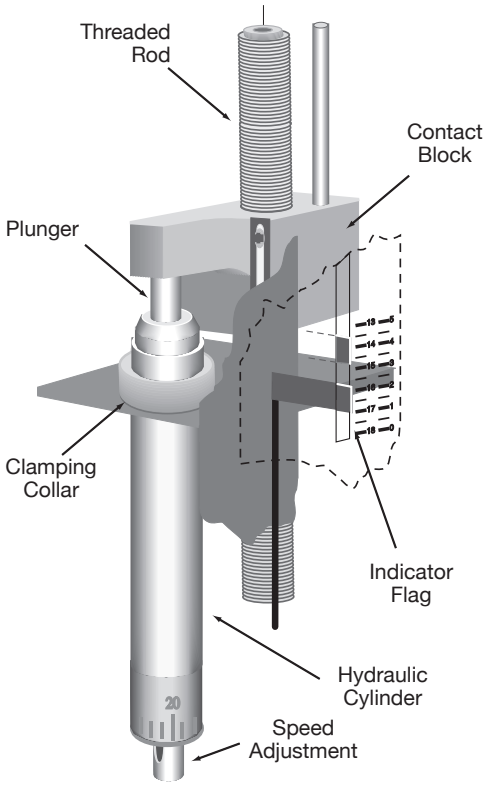

Figure 4-2 *Physical Location of the Hydraulic Control Components*

Hydraulic Speed Control Adjustment

Rotating this shaft adjusts the internal metering aperture which regulates the flow of the silicone fluid. There are two ways to adjust the hydraulic speed control setting. First make sure that the slide assembly is fully retracted (up position). This will uncover the hydraulic damper and shaft.

- Insert the end of a small screwdriver or similar tool into the hole (**Figure 4-3**) in the adjustment shaft of the hydraulic cylinder, OR,

- Locate the slot on the bottom of the cylinder (**Figure 4-4**). Insert a screwdriver in the slot and adjust the setting.

Just above the shaft is a scale with 30 divisions. On the adjustment is a vertical groove that indicates where along the scale the speed is set. Zero (0) is the fastest setting and thirty (30) is the slowest.

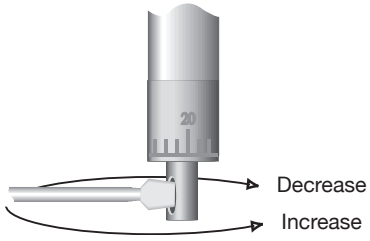

Figure 4-3 *Adjustment Using the Hole*

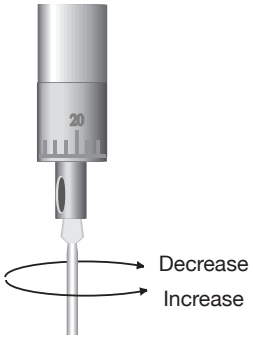

Figure 4-4 *Adjustment Using the Slot*

Installing the Distance Encoder

Purpose

To install and calibrate the distance encoder in order to accurately measure the distance of thruster travel.

Requirements

Parts

Kit consisting of the following:

1. 625-14 Encoder (2 pieces)
2. Encoder Head cable cover bracket
3. Mounting screws and hardware

Tools

- Phillips-head screwdriver
- Feeler gauge set (0-.050 inches) or metric equivalent
- 6 inch ruler or metric equivalent

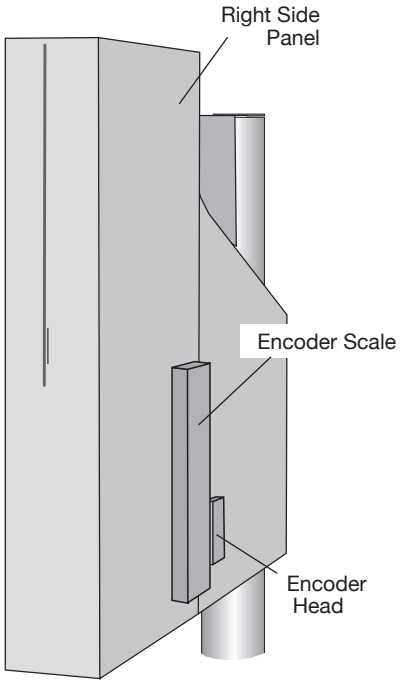

Figure 4-5 *Distance Encoder Mounting*

Installation Instructions

Dismantling

1. Facing the front of the press, remove the panel from the right side of the press. (See **Figure 4-5**.)

Reassembly

1. Mount the cable cover bracket from the kit and secure it with flathead screws.
2. Attach the encoder scale to the mounting screw holes in the right side of the thruster with pan-head screws. Do not tighten.
3. Remove the back panel from the press and route the encoder head cable, being careful not to interfere with the press movement.

4. Connect the cable to the DPC connector J-401 (Thruster Stroke Encoder).

5. Replace the rear panel on the press.

6. Gently slide the encoder head down until the mounting screw holes in the press support base appear in the head's mounting slots.

7. Center the screw holes in the mounting slots. Secure the encoder head with the two pan-screws but do not tighten them yet.

Alignment

The purpose of this alignment is to set the internal reference mark for the encoder. This reference mark resets the distance register in the DPC after each thruster cycle and ensures repeatable distance measurements from cycle to cycle.

1. Check the position of the encoder scale's mounting hole slots using the 6" ruler. Measure the distance from the center of the screw to the edge of the slot in both directions. When the screws are centered horizontally, carefully tighten the screws.

2. Measure a vertical distance of 1.375 inches (34.92 mm) up from the bottom edge of the encoder scale, as shown in **Figure 4-6.**

3. Adjust the bottom edge of the encoder head to align to this distance and tighten the screws on the encoder head.

Keep hands and clothing away from press when it is activated.

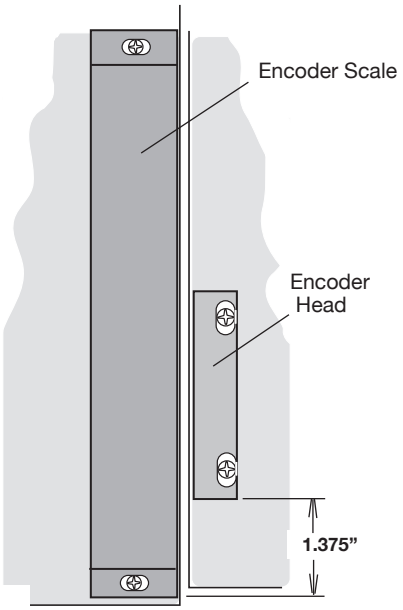

Figure 4-6 *Distance Encoder Alignment*

4. Turn on the DPC. Set the DPC to measure distance.

5. Set the air pressure to the desired level.

6. Perform the following procedure to test the encoder for the proper setting:

    a. Run one weld cycle. If the encoder position reads negative (-.xxx), then the encoder is above the "0" reference point used for measuring distance by the DPC. This is the correct setting. Secure the two screws. Proceed to Step 7.

    xxx = approximately -.125 inch to .-250 inch.

    b. If the encoder position reads positive (+.xxx) after running one cycle, loosen the two encoder head screws and slide the head down until the reading goes negative (-.xxx). Secure the two screws. Repeat Step 6a.

7. Set the gap between the encoder scale and head, using the feeler gauge .039 inch (1 mm) blade.

8. Measure the gap at the top and bottom of the stroke. Allowable tolerance, as specified by the encoder manufacturer, is ±.005. This is a range of from .034 to .044 inches (.864 to 1.12 mm).

9. Tighten all the screws and check the measurements again.

10. Replace the press/thruster right side panel.

Electronic Press Controls

The electronic press controls consist of the following three components:

Electronic Pressure Regulator

The electronic pressure regulator, (I/P transducer) is an electro-pneumatic replacement for the manually adjusted air regulator on the press. The I/P transducer converts the electrical signal current (I) into air pressure (P). The Electronic Regulator converts the electrical signal from the DPC into the programmed air pressure.

The pressure value settings, "Pressure 1" (P1) and "Pressure 2" (P2), are stored in the Process Setup under Pressure in the DPC. P1 and P2 are set in pounds per square inch (PSI), or BARS.

To monitor Pressure 1 and Pressure 2 values, use the Check Pressure parameter, contained in the Operate Setup under View Parameters (on the DPC).

The DPC uses a pressure transducer to measure the I/P output pressures.

The I/P transducer installed in this thruster/press does not require on-site calibration. The unit is equipped with self- correcting, closed-loop circuitry.

Pressure Transducer

The pressure transducer (P/I transducer) performs the same function as the air gauge on the press. The P/I transducer converts air pressure (P) to an electrical signal current (I). It then sends the signal to the DPC. The DPC displays this signal as pressure.

Two sets of upper and lower limits can be monitored with the pressure transducer:

One set is used to monitor the air pressure before a cycle starts. Using the bad parts limits, the unit will not begin a cycle if the air pressure is outside the pressure window that has been set.

This set of limits is used to ensure that air pressure from the input line has not dropped below the required pressure for an acceptable weld force.

The other set of limits is used to monitor the air pressure when the ultrasound is turned on.

This feature can be used as an indicator when checking for a trigger or load cell malfunction.

A more precise way to monitor trigger force is to use a load cell.

The pressure transducer does not require any on-site calibration.

Load Cell

A load cell (force transducer) is a device used to measure force. A force transducer converts mechanical force into an electrical signal.

The load cell is used to monitor the force applied to the part. It sends a signal to the DPC to indicate when the mechanical pressure equals the programmed "Trigger Force". The trigger is the point at which the ultrasound is turned on.

The Trigger Force parameter is located on the Process Control Setup under Trigger Method on the DPC. The values for this parameter are in pounds or Newtons.

A force versus time graph can be generated if a printer or a computer with iPC software is connected to the DPC.

The Load Cell is calibrated at the factory. It does not require any on-site calibration.

SECTION 5

Stack/Fixture Setup

- This section provides detailed information regarding the proper installation and removal of the stack assembly. It also contains the procedure for assembling and disassembling the stack components.

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Overview

A Dukane press/thruster and a DPC (Dynamic Process Controller) generator can be used to assemble a unlimited variety of parts for every conceivable market segment, including Automotive, Medical, Appliance, Consumer, Packaging and Toy industries. Various techniques and processes, such as welding, staking, swaging, inserting, and spot welding can be used for the different applications.

This variety is made possible through the interchange of some system components. Of these components, the horn and fixture are usually custom-made for each application, and the booster that is selected for a job depends on the required horn output amplitude. Also, the press/thruster controls are specifically adjusted for each application.

This section provides instructions for setting up these components of the system in a new installation or when changing applications.

Stack Description

The stack shown in **Figure 5-1** consists of three components:

- Transducer
- Booster
- Horn

The transducer and the booster are normally shipped assembled and installed in the press. The horn and/or the fixture may be shipped separately.

The stack is easily removed from or installed in the press/thruster. This makes it possible to change the horn or booster. It also makes it easier to perform regular inspections and/or maintenance of the stack components.

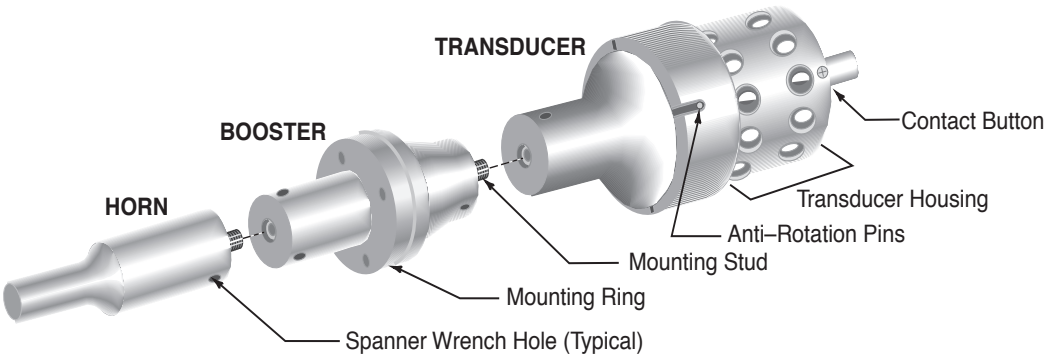

Figure 5-1 *Stack Components*

Changing Stack Components

Stack Removal

Before removing the stack, perform the following steps:

1. Activate the Abort switch on the front of the base.
2. Power down the DPC.

These two steps are necessary to ensure that no power will be accidently applied while removing the stack.

3. While supporting the stack with one hand, loosen the two socket-head bolts that secure the stack access door.

CAUTION

The stack access door on the press/thruster holds the stack components in the stack housing. Hold the stack by the HORN or the exposed part of the BOOSTER when opening or closing the access door. This will prevent the stack from falling out and being damaged.

4. Pull the stack forward and down until the transducer clears the electrical contact. Refer to **Figure 5-2**.

CAUTION

There may be an electrical charge stored in the transducer. To avoid any electrical shock, do not touch the contact button when removing the stack.

5. Lift the stack out of the housing.

Note: When changing or inspecting any of the stack components, ALWAYS remove the stack from the thruster.

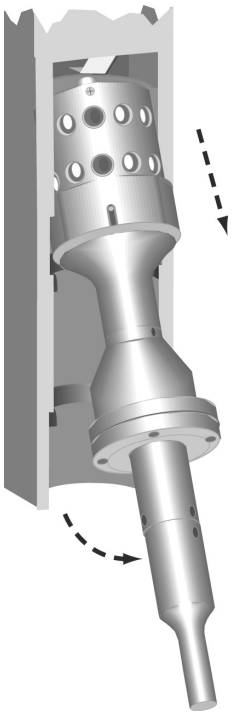

Figure 5-2 *Stack Removal*

Stack Disassembly

To separate the stack component carefully follow the instructions below:

1. Use the two spanner wrenches (wrench A and B) provided with the press. Place wrench A on the component to be removed (Refer to **Figure 5-3**) and wrench B on the one next to it. Turn wrench A in the direction indicated.

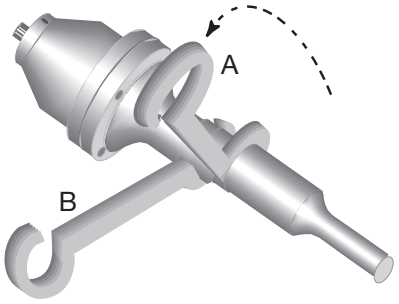

Figure 5-3 *Disassembling Components*

CAUTION

To avoid possible injury, press down on the spanner wrench with the palm of the hand.

Once the component is loose, it can be removed by hand.

2. To maintain structural integrity, NEVER hold a transducer by the housing or the booster by the mounting rings while separating components. Doing so will result in damage to the unit.

3. Use only the tools recommended by Dukane. NEVER clamp a horn, booster, or transducer in a vise or use tools such as pliers, visegrips, etc.. Doing so will result in scratches and/or gouges, resulting in stress areas on the surface. This condition will affect the stack operation and could lead to failure of each stack component.

Removing a Detachable Tip

If the horn has a detachable tip, do the following:

Use a spanner wrench to hold the horn, as shown in **Figure 5-4**.

Turn a properly sized open end wrench to loosen the tip.

NEVER clamp the horn or use a vice to hold it.

Figure 5-4 *Tip Removal*

Stack Assembly

Before assembling a stack, inspect all of the components for possible damage — especially the surfaces that are to be joined. Look for non-flat surfaces (concave, convex), stress cracks, chips, or gouges. Any of these irregularities will affect the operation of the stack and could cause further damage. Contact the Dukane Ultrasonics Tooling Department concerning a damaged component.

When the components have been inspected and are found to be free of any damage, continue with the following steps:

1. Inspect the contact surfaces for smoothness and cleanliness. Pitting or a buildup of old grease and dirt on the surface will interfere with the transfer of energy from one component to another.

2. Remove any foreign matter from the threaded stud and the mating hole. Tighten the stud in the stack component that is most distant from the transducer according to the following stud torque values:

Stud Thread Size	Torque		
	inch-lbs	foot-lbs	Nt-meters
1/2 in. x 20	12	1	1.35
3/8 in. x 24	12	1	1.35
M8 x 1.25	12	1	1.35

3. Coat one of the contact surfaces with a thin coat of high- pressure grease. A small packet is supplied with the system. We recommend Dow–Corning #4 (or #111 as an alternate).

Note: Do not apply any grease or lubricant to the stud.

4. Thread the components together and tighten (Refer to **Figure 5-5**) by applying torque as follows:

   For 20 kHz: The applied torque should be 35 ft-lbs (47.4 Newton-meters) [± 5 ft-lbs].

   For 30 kHz and 40 kHz: The applied torque should be 20 ft-lbs (27.1 Newton-meters) [± 5 ft-lbs].

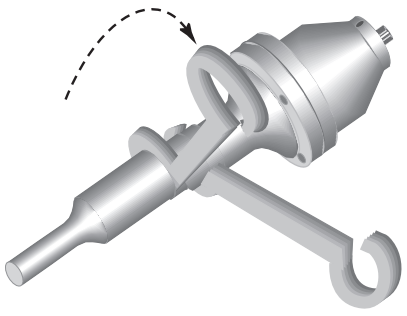

Figure 5-5 *Assembling Components*

Installing a Detachable Tip

If the horn has a detachable tip, do the following:

1. Inspect the surfaces of the tip and the horn for any stress cracks, chips or gouges.

2. Coat one of the contact surfaces with a thin coat of high-pressure grease or lubricant. We recommend Dow–Corning #4 (or #111 as an alternate).

   Note: Do not apply any lubricant to the tip threads.

3. Thread the tip into the horn. To tighten the tip, use the open-end wrench for the tip and a spanner wrench to hold the horn, as shown in **Figure 5-6**.

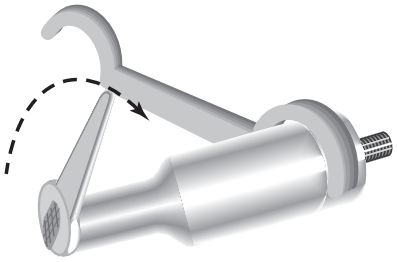

Figure 5-6 *Tip Assembly.*

Tighten the tip to the following torque specifications:

Tip Stud Thread Size	Torque		
	inch-lbs	foot-lbs	Nt-meters
1/2 in. x 20	360	30	40.7
3/8 in. x 24	336	28	37.9
5/16 in. x 24	300	25	33.9
1/4 in. x 28	240	20	27.1

Installing The Stack

1. With the stack at the angle shown in **Figure 5-7**, rest the booster mounting ring on the pin of the stack housing.

2. Brace the stack at point A in Figure 5-7, and swing the stack to a vertical position. The ultrasound contact button on the transducer should snap under the electrical contact leaf of the housing.

3. While still supporting the stack in this vertical position, close the stack access door and thread the socket-head bolts that hold the door closed into their holes.

4. If the horn is not properly aligned with the fixture, rotate the stack to align the horn with the fixture.

5. Finish tightening the socket head bolts until snug. DO NOT OVER-TIGHTEN!

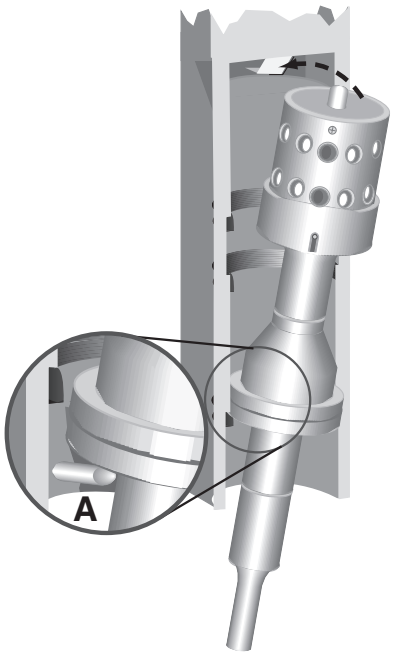

Figure 5-7 *Stack Installation*

Fixture Installation

There are three steps involved in installing a fixture.

- Aligning the fixture with the horn
- Leveling the fixture to provide the necessary support
- Rigidly securing the fixture to the mounting surface

Fixture Alignment

To safely align the fixture under the horn, use the following procedure. (Refer to **Figure 5-8**.)

1. Depress the Abort switch. This allows the acoustic stack assembly to be lowered by hand and prevents the system from accidentally cycling.
2. Turn off the power to the DPC to prevent accidental ultrasound operation.
3. Place the fixture, with parts, under the horn.
4. Initially align the two slots in the fixture over two of the seven mounting holes on the base plate.
5. Install the two hold-down bolts with washers, and finger tighten.

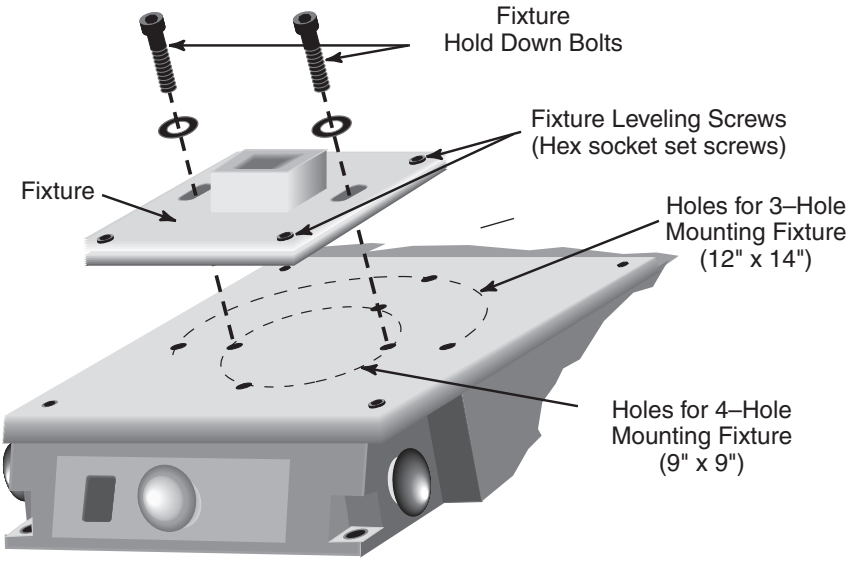

Figure 5-8 **Fixture/Base Layout**

Note: The fixture should be flat on the base. If the fixture is equipped with leveling jack screws, adjust the screws so that they do not interfere with seating of the fixture on the base plate.

6. Place a part in the fixture.
7. Grasping the horn firmly, pull the acoustic stack assembly down until the horn is as close to the part as necessary to align the fixture.
8. Align the fixture with the horn, and tighten the hold-down bolts, or caps crews, to prevent the fixture from moving.
9. Adjust the mechanical stop of the press so that the horn stops above the fixture. This prevents pinch points and avoids horn damage if the acoustic stack assembly descends when a part is not in the fixture.

Note: Some applications may require the horn to be a few thousandths of an inch from contact with the fixture.

Special applications may require the Mechanical (MEC) stop to be lowered so the horn makes contact with the fixture or anvil. When this is required, a ground-detect circuit is needed to terminate the weld cycle.

Fixture Leveling

For most applications, the fixture must be mounted so that the contacting surfaces on the horn are parallel to the contacted surfaces on the plastic part. This ensures that a consistent, even weld will result. To level the fixture, do the following:

1. Place a part in the fixture.
2. Loosen (turn counterclockwise) the hold-down bolts or cap screws and the four leveling jack screws on the fixture plate. Refer to **Figure 5-9**.
3. Pull the acoustic stack assembly down to the fixture. Allow the horn and the part to align.
4. Turn the four jack screws clockwise until a slight resistance is felt. Refer to **Figure 5-10**.

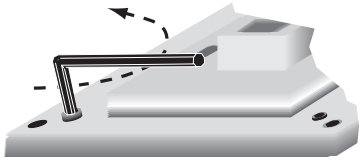

Figure 5-9 *Loosening the Hold–Down Cap Screws and Jack Screws*

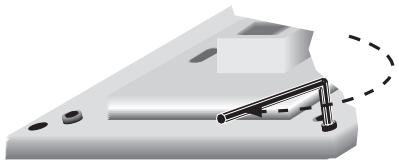

Figure 5-10 *Tightening the Hold–Down Cap Screws and Jack Screws*

5. Tighten the hold-down cap screws by turning them clockwise until a firm resistance is felt.

Note: Do not overtighten the cap screws. This may flex the fixture plate.

6. If any readjustment is necessary, loosen the hold-down screws first. Then readjust the jack screws.

The following procedure may be helpful in leveling the fixture in some applications. To perform this procedure, use a piece of carbon paper and a piece of white paper.

1. Place a sample part in the fixture.
2. Place a piece of white paper on top of the sample part.
3. Place a piece of carbon paper, carbon side down, on top of the white paper.
4. Enter the following parameters into the DPC:

   Weld Time = 0.05
   Hold Time = 0.00
   Pressure =20-40 psi

   System parameters = Use default settings. See examples on Application Setup Worksheet.

5. Set the trigger control on the thruster so that the pressure switch closes after some pressure is applied.
6. Press the ONLINE button on the DPC.
7. Cycle the equipment by depressing the two activation switches on the base or by triggering the automation switch.

When one cycle is completed, the pressure developed between the horn and the sample part will have left marks from the carbon paper on the white paper. If the fixture is not level, the carbon markings will be darker in some areas than in others. All carbon markings will be uniform when all adjustments have been made properly.

Adjust the leveling of the fixture and repeat this procedure as necessary until you are confident that the fixture is level.

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SECTION 6

Systems Test

- This section provides the testing methods used to ensure that the press system is functioning properly before normal operations start.

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Overview

A Dynamic Process Controller (DPC) must be operating and connected to the press/thruster in order to test the system.

For efficient operation of a Dukane ultrasonic assembly system, the ultrasound signal from the Dynamic Process Controller must match the frequency and phase angle (vibrational characteristics) of the stack that is being driven. Each stack has unique vibrational characteristics dependent on the combination of stack components. In addition, the characteristics of a particular stack may vary slightly during operation because of temperature and loading factors.

To match the DPC generator output signal with the characteristics of a particular stack, the generator output frequency is adjusted by Dukane's patented Phase-Locked-Loop AUTO-TRAC Pulse-Width Modulation circuitry.

The AUTO-TRAC feature automatically adjusts the ultrasound signal to match the vibrational characteristics of the stack being driven. When the ultrasound turns on during each operating sequence, the AUTO-TRAC circuit monitors the motion of the stack on a frequency cycle-by-cycle basis and adjusts the ultrasound signal for the optimum setting. Because the AUTO-TRAC continuously monitors each operating sequence, it compensates for vibrational changes that occur during repeated operations due to heating of the stack components. It also compensates for changes that occur over longer time periods due to aging of the piezo electric crystals in the transducer, or possible wear of the ultrasonic horn.

The AUTO-TRAC feature excels in environments hostile to reliable operation, such as high duty cycles or high stress, and continuous-duty applications. In such situations, the AUTO-TRAC circuit compensates for the unique vibrational characteristics of each stack due to differences caused by aging, loading, temperature changes, and differences in horn configurations.

Operational Test of the Acoustic Stack

The following test procedure is suggested before starting the DPC operation, to verify that the vibrational characteristics of the stack fall within the range of the AUTO-TRAC. All Dukane stack components are manufactured to tolerance specifications within this range. A non-Dukane horn, an improperly assembled stack, or a stack component that is worn or damaged, can result in vibrational characteristics outside these specifications, and will require some adjustment. This test reveals the existence of any problems and directs you to corrective action.

1. Check the following:

    a. Make sure that the correct booster and horn for the application are installed in the thruster.

    b. Check the DPC for proper grounding.

    c. Check the ultrasound cable connections on the DPC and thruster for proper seating and security.

    d. Verify that the horn is not under load (not in contact with a fixture or part).

2. Turn the DPC power switch to ON. The INPUT TEST display will start to flash on and off for LESS THAN 20 seconds. It will then turn off and the ON/OFF LINE display will come on. This indicates that the system is operating (Refer to **Figure 6-1**).

    Note: The system retains the last state (ON LINE or OFF LINE) that it was in when it was powered down.

    If the INPUT TEST display stops flashing but remains on, do not go any further, there is a problem with the input circuit.

    Note: Each time the TEST button is pressed, the display screen shows the power and frequency of the horn being tested. Be sure to check the System Power Output display for verification.

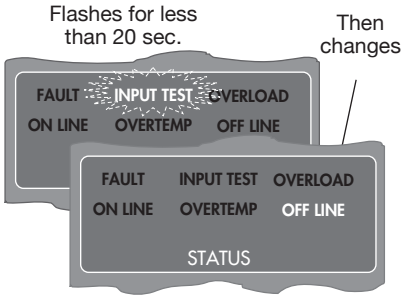

Figure 6-1 *Initial Startup Display*

3. Press the DPC TEST button:

and hold it until the display of **Figure 6-2** appears on the generator status panel, and the output power and frequency appear on the display screen (**Figure 6-3**):

   a. System Power Output:

      - If the power output display remains between 10 and 20 percent and the horn frequency is (220 Press) within 19,500 Hz and 20,500 Hz, the stack is operational. (340 Press) within: 28,500-30,500 Hz, & 39,500-40,500 Hz.

      - If the power output exceeds the 20% indication, there may be a problem with the stack.

   b. If the OVERLOAD indicator (**Figure 6-4**) is displayed, a mismatch has occurred between the generator's ultrasonic output signal and the stack.

   If the ultrasonic output stops, the System Power Output indicator display drops to zero, and the System STATUS indicates an OVERLOAD: The DPC overload protection circuit has shut the ultrasound off.

   Release

. This will reset the protection circuit and turn off the light. Proceed to the next step.

4. While pressing the TEST button, lightly touch the side of the horn to check for ultrasonic vibrations. If any vibrations are felt, the stack is operational. If there is no vibration, there may be a problem with the stack.

   If all the indicators pass their tests, the stack is within the AUTOTRAC range.

   The DPC is operating at the optimum setting for this stack when the System Power Output indicator display during this test is between 10 and 20 percent. The vibration amplitude of the horn and booster and the mass of the horn determine the amount of energy needed to vibrate the stack.

   - If the system passes the tests of these 4 steps, proceed to the section called *Running Sample Parts and Making Adjustments.*

   - If one or more of these tests have failed, go to the next step.

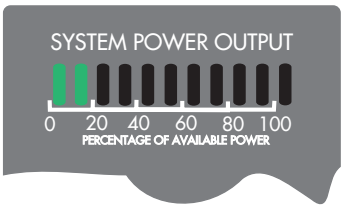

Figure 6-2 *Acceptable Test Conditions*

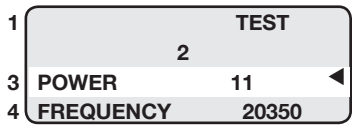

Figure 6-3 *TEST, Screen Display*

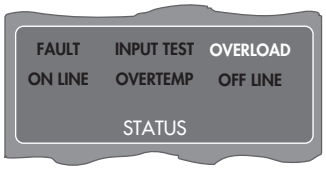

Figure 6-4 *System Mismatch Display*

5. Turn the DPC off. Check the stack for proper assembly, damaged components, or dirty mating surfaces. Recheck the ultrasound cable for proper connections. Repeat steps 1 through 4. If the test still fails, go to the next step.

6. Turn the DPC off, remove the stack from the thruster, and remove the horn from the stack. Reinstall the transducer-booster assembly in the thruster and turn the DPC on. Repeat steps 2 through 4.

   If the assembly passes with the horn removed, the horn is outside the specifications required for operation with the AUTO-TRAC preset range. Reassemble the horn to the stack.

   Refer to the DPC manual Section - *Hardware Setup*. Using the DPC, select the sub-menu GENERATOR; then select recommended SETTINGS for the software adjustments for PHASE, SOFTSTART and FREQUENCY. The PULSE WIDTH setting can only be monitored. Press the DPC TEST button again.

   If any failure indications are present with the horn removed, check the booster and the transducer for the following

   - Any visible damage
   - Loose or cracked stud
   - Pitted or dirty mating surfaces

   Make any necessary repairs or adjustments.

   Go to step 7.

7. Repeat steps 1 through 6.

   - If the failure indications disappear, reassemble the horn to the stack and repeat steps 2 through 4.
   - If any failure indications are still present, do not run this stack. Return the transducer and booster to Dukane for analysis.

Procedure for Cycling the System

1. Check that you have correctly performed the following:
   a. Installed the stack in the thruster and bolted the stack access cover closed.
   b. Secured the fixture in place.
   c. Performed the "Operational Test of the Acoustic Stack."
2. Press the ON-LINE button

.
3. Verify that all controls on the Press/Thruster and the DPC are set as required for this operation.
4. Place a part in the fixture.
5. Cycle the system.

Press the dual pushbutton activation switches simultaneously to activate the system, and hold them down until the ultrasound starts. Releasing them before activation of the ultrasound will abort the cycle.

Running Sample Parts and Making Adjustments

When setting up or monitoring an application, there are two factors to check:

1. Check the amount of power being drawn.

   Before cycling the system, be sure you are where you can view the System Power Output indicator and the OVERLOAD light on the front of the DPC.

   Repeated operations that draw too much power from the DPC can result in damage to system equipment. Monitor the System Power Output and the System Status for the following conditions:

   a. System Power Output indicator in the yellow or red areas (refer to **Figure 6-5**).

   Make sure you have performed the proper ultrasonic stack maintenance. In addition, provide for proper cooling of the ultrasonic stack.

   b. System STATUS indicating an OVERLOAD.

      Do not continue operation. Perform the "Operational Test of the Acoustic Stack" (on preceding pages).

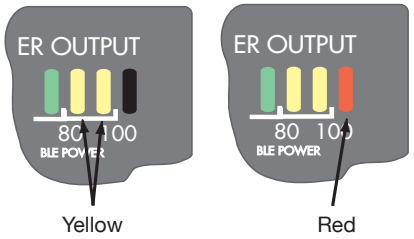

Figure 6-5 *Overload Indicators*

2. Check the quality of an assembled part for the following:

   a. Strength of the joint, assembly, or seam.

   b. Appearance of the assembled part should meet your quality standards.

SECTION 7

Stack Maintenance

- This section provides information and explanations on the proper way to care for the stack components.

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Inspection of the Acoustic Stack Components

It is essential that the mating faces between an ultrasonic transducer/booster and a booster/horn be absolutely flat and parallel. If there is any air gap, there will be a loss in power output and efficiency. Coupling may be so poor as to prevent the startup of vibration from the stack, due to the excessive power draw at the mating surfaces.

The condition of excessive crowning, or uneven contact surfaces, is normally made evident by a burnished appearance around the bolt hole areas of the contact surfaces. This condition indicates that contact between the parts occurs only at the burnished areas and not across the full faces of the mating surfaces. (See **Figure 7-1**.)

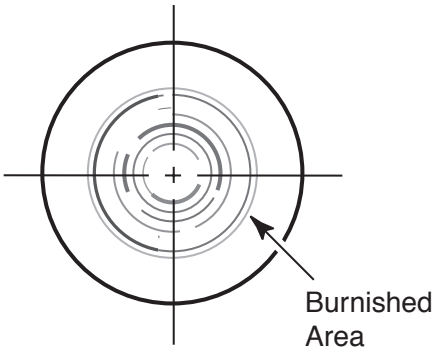

Figure 7-1 *Example of Burnished Area*

The following flatness tolerances are specified for Dukane transducers, boosters, and horns used in 20 kHz applications:

Transducer	.0005 inch
Booster	.0005 inch
Horn	.0005 inch

To check if there may be a flatness problem, first disassemble the stack and look at the mating surfaces. If there are burnished areas at the periphery of a contact surface, that surface may be crowned in the center. Place a straightedge along the face (refer to **Figure 7-2**). If light can be seen along the edges, it is crowned.

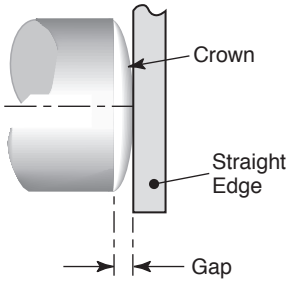

Figure 7-2 *Example of Crowning*

The surface may also be depressed in the bolt area (refer to **Figure 7-3**). In this case, there will be contact only at the peripheral edges and light will be visible beneath the straightedge in the center region.

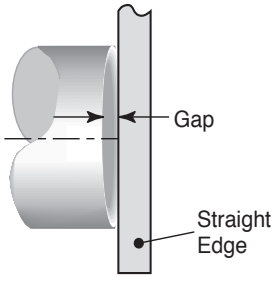

Figure 7-3 *Example of Center Depression*

Reconditioning Stack Components

Note: The operating efficiency of the equipment will be greatly affected if the mating interfaces of the transducer/booster/horn stack are not flat, make poor contact with each other, or become corroded. A poor contact condition wastes power output, makes tuning difficult, can affect the noise level, and can cause possible heat damage to the transducer.

To restore the interface to the proper condition, do the following:

1. Disassemble the transducer/booster/horn stack and wipe interfaces with a clean cloth or paper towel.

2. Examine all interfaces. If any interface is corroded or shows a dark, hard deposit, it should be reconditioned.

3. If the interfaces appear to be in good condition, go to step 11.

4. If necessary, remove the mounting studs.

5. Tape a clean sheet of #400 grit (or finer) silicon carbide wet-or-dry paper to a clean, smooth, flat surface. A piece of plate glass is usually suitable.

6. Hold the part to be conditioned at its lower end with your thumb over a spanner wrench hole. Carefully stroke the part **once** in one direction (toward you) across the abrasive paper, as shown in **Figure 7-4**. Do not apply downward pressure. The component's weight alone provides sufficient pressure. Perform a second stroke.

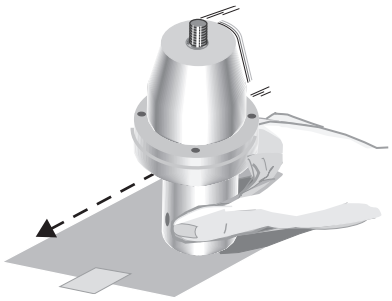

Figure 7-4 *Method of Component Resurfacing*

IMPORTANT

Use extreme care to avoid tilting the part. Loss of flatness of interface surfaces may render the welding system inoperative.

7. Rotate the part 120° (1/3 rotation) to the next spanner wrench hole. Repeat the procedure outlined in step 6.

8. Rotate the part the remaining 120° and repeat. Be certain to perform the same number of strokes at each orientation: Two strokes per rotation.

IMPORTANT

Use extreme care to avoid multiple strokes at each 1/3 rotation of the part. Loss of flatness and perpendicularity of the interface surface to the centering axis of the part may render the welding system inoperative.

9. Before reinserting a stud in any horn, perform the following for proper engagement of the threads:

   a. Visually inspect and clean the stud.

   b. Clean the threaded hole using a clean cloth or towel.

   c. Tighten the stud to the torque specifications listed in **Table 7-1.**

   Note: Thread deformation may occur if the studs are overtightened. Removal of the stud could damage the threads in the horn. If this occurs, re-tap the horn threads and replace the stud with a new one. Use studs recommended by Dukane.

10. Reexamine the interface surface and repeat steps 6 through 9 until most of the contaminate has been removed. This should not take more than 2 or 3 complete rotations of the part being reconditioned.

11. Reassemble and install the stack, using the procedure in Section 5 of this manual. Recheck the power supply tuning. See Section 6, *System Test*.

Torque Values

The correct torque values for stack component assemblies are as follows:

- The torque values for the transducer/booster/horn assembly for:

  20 kHz = 420 inch-lbs./35 foot-lbs. ± 5 ft-lbs.

  30 kHz and 40 kHz = 240 inch-lbs./20 foot-lbs. ± 5 ft-lbs.

- For horn and booster studs, refer to **Table 7-1**.

Stud Thread-Size	Torque	
	foot-lbs	Newton-meters
1/2 in x 20	1	1.35
3/8 in. x 24	1	1.35
M8 x 1.25	1	1.35

Table 7-1 *Stud Torque Values*

- For detachable tips on horns, refer to **Table 7-2**.

Tip Thread-Size	Torque	
	foot-lbs	Newton-meters
1/2 in x 20	30	40.7
3/8 in. x 24	28	37.9
5/16 x 24	25	33.9
1/4 x 28	20	27.1

Table 7-2 *Tip Torque Values*

Note: Overtightening stack components may result in horn/booster studs loosening and unexplained overloads.

SECTION 8

Troubleshooting

- This section provides a list of the more common problems that may occur in the various ultrasonic processes. It also provides suggested corrective actions.

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Applications

The Troubleshooting section of this manual contains a listing of problems that may occur when using this equipment along with probable causes and recommended solutions for the problems.

Regarding solutions, please note the following:

Where the solutions section refers to changing a setting for a primary weld characteristic or altering the position of the End-of-Weld limit switch, these adjustment capabilities and controls must be available on your equipment.

Primary Weld Characteristics

Primary weld characteristics refers to quantities with which the welding process can be controlled. The characteristics include Time, Distance, Absolute Distance, Energy, and Peak Power. Each characteristic requires that your system contain certain components for adjusting the characteristic. **Table 8-1** shows each characteristic and its equipment requirements.

Characteristics	Equipment Requirements
Time	Generator with a digital timer or process controller with a time function.
Distance	Process controller with a distance measurement function and a press / thruster equipped with an optical distance encoder.
Absolute Distance	Process controller with a distance measurement function and a press/thruster equipped with an optical distance encoder, or a press/thruster with an End-of-Weld limit switch installed.
Energy, Peak Power	Process controller with an energy measurement function.

Table 8-1 *Equipment Requirements*

The generator/digital timer should be any of Dukane's 20 kHz generators controlled by a digital timer. The process controller is the Dynamic Process Controller™ (DPC). The DPC is equipped with a generator, a processor module, and a combination of control modules.

End-of-Weld Limit Switch

The End-of-Weld limit switch is used to terminate the ultrasound power burst during a weld cycle as determined by the stroke position of the press head. The switch is generally not used with a system that contains a process controller with a distance measurement function or a press/thruster equipped with an optical distance encoder.

Welding

Problem

Flash (*See also* Nonuniform welding)

Probable Cause	Solution
Energy director is too large.	Reduce the size of the energy director. Reduce the weld time/primary weld characteristic. Reduce the air pressure. Use an interrupted energy director.
Shear interference is too great.	Reduce the amount of interference.
Weld time is too long.	Reduce the weld time.
Non-uniform joint dimensions.	Re-dimension the joint. Redesign the joint to be a shear joint or a tongue-in-groove joint. Contact Dukane's Applications Lab. Check the processing conditions.
Part fit or tolerances.	Loosen the part fit. Loosen the part tolerances.

Problem

Misalignment of the welded assembly

Probable Cause	Solution
Parts are not self-aligning	Design a means of alignment into the tooling (fixturing). Add a means of alignment (e.g., pins and sockets) to the mating part halves
Improper support in the fixture	Redesign the fixture for proper support
Wall flexure.	Add ribs or gussets to the part. With a resilient fixture, if large sections of urethane are deflecting, add a rigid backup.
Joint design is not properly dimensioned.	Re-dimension the parts.
Incorrect part tolerance/poor molding.	Tighten the part tolerance. Check the processing conditions.

Welding

Problem

Internal components are welding together.

Probable Cause	Solution
The internal components are made of the same material.	Make the internal components out of different materials. Carefully lubricate the internal parts. Use less horn amplitude by changing to a lower gain booster.

Problem

Diaphragm Damage

Probable Cause	Solution
Excessive horn amplitude.	Reduce the horn amplitude. Dampen the welding area to absorb the amplitude.
Excessive exposure to ultrasound.	Reduce the weld time and increase the horn amplitude and/or air pressure.
Improper gate location/design/thin-wall sections.	Check gate placement. Change the shape of the gate. Add stiffening ribs to the part. Increase the thickness of the material on the underside of the gate area. If using a 20 kHz system, consider using a 30 kHz or 40 kHz system.
The type of horn and/or its placement.	Check for the proper horn/part fit. Change the horn.

Problem

Overwelding

Probable Cause	Solution
Too much energy is being transmitted to the part.	Reduce the air pressure. Reduce the weld time/primary weld characteristic. Change to a lower gain booster to reduce the horn amplitude. Reduce downstroke speed.

Welding

Problem

Internal components of work piece damaged during welding.

Probable Cause	Solution
Excessive horn amplitude	Reduce the horn amplitude by changing to a lower gain booster. Dampen the excess horn amplitude.
Excessive exposure to ultrasound.	Reduce the primary weld time and increase the horn amplitude by changing to a higher gain booster.
Too much energy transmitted into the part.	Reduce the horn amplitude. Reduce the air pressure. Reduce the weld time/primary weld characteristic.
The components are improperly mounted (e.g., parts are mounted too close to the joint area).	Ensure that internal components are mounted properly. Isolate internal components from the part. Move the internal components away from areas of high energy. Use an external device to dampen energy locally.

Problem

Melting or fracturing of the part (outside of the joint area).

Probable Cause	Solution
Sharp internal corners/thin sections.	Radius all sharp corners. Dampen motion for any damaged area, if possible.
Excessive horn amplitude.	Reduce the horn amplitude by changing to a lower gain booster.
A long weld time.	Decrease the weld time and increase the horn amplitude and/or the air pressure.
Inherent stress.	Check the molding conditions. Check the part design. Reduce the horn amplitude.

Welding

Problem

Underwelding

Probable Cause	Solution
Insufficient energy is being transmitted to the part.	Increase the air pressure. Increase the weld time/primary weld characteristic. Change to a higher gain booster to increase the horn amplitude. Use a more powerful assembly system.
Energy is being absorbed into the fixture.	Change the type of fixture being used.

Problem

Uneven welding

Probable Cause	Solution
Warped part(s).	Check part dimensions. Check the molding conditions. Use a higher trigger pressure. Use a higher hold pressure.
The energy director varies in height.	Redesign the energy director to ensure uniform height. Use an interrupted energy director.
Lack of parallelism between the horn, the fixture, and the part.	Make sure the thruster is perpendicular to the part. Check the part dimensions.
Wall flexure is occurring.	Add ribs to the part. Modify the fixture to prevent outward flexure
The knockout pin location is in the joint area	Redesign the part so the knockout pin is not in the joint area (Make sure knockout pins are flush with the surface)
There is insufficient support in the fixture.	Redesign the fixture to improve the support in critical areas. Change to a rigid fixture. If large sections of urethane are deflecting with a resilient fixture, add a rigid backup.

Welding

Problem

Uneven welding (continued)

Probable Cause	Solution
Part dimensions are incorrect.	Check the part dimensions. Re-dimension the part, if necessary. Check the molding conditions.
The parts are improperly aligned.	Check for part shifting during welding. Check the alignment of mating parts. Check for parallelism of the horn, the part, and/or the fixture.
There is a lack of intimate contact around the joint area.	Check the part dimensions. Check the part tolerances. Check for knockout pin marks in the joint area. Check for misalignment of the mating part halves. Check for sinks.
Non-uniform horn contact is occurring.	Check the fit of the part to the horn. Check for proper support in the fixture.
Mold release is on the joint surface(s).	Clean the mating surfaces.
There is a non-uniform distribution of filler in the plastic material.	Check the molding conditions. Check the mold design.
The joint design is incorrect.	Redesign the joint.
There is a material or resin grade incompatibility problem.	Consult with the resin supplier(s).
There is a regrind problem.	Check with the molder. Check the molding conditions.
There is moisture in the molded parts.	Specify the parts to be “dry as molded”. Dry the parts by heating them prior to welding.

Welding

Problem

The parts are marking

Probable Cause	Solution
The horn heats up.	Check for a loose stud, tighten if loose. Loosen and then retighten the horn tip. (Refer to Section 5). Reduce the weld time. Ensure that the horn and booster are coupling well (Refer to Section 5). Visually check the horn for cracks.
There are high spots in the part.	Check the part dimensions. Check the fit of the horn to the part.
Use of raised lettering.	Use recessed lettering or relieve the horn around the lettering.
The part does not fit the fixture properly.	Check the fixture for proper support. Check for cavity-to-cavity variations. Redesign the fixture.
Oxide from the horn is being transferred to the part.	Place polyethylene film between the horn and the part. Use a chrome-plated horn and/or fixture.
The parts contain fillers.	Check the processing conditions. Reduce the amount of filler in the plastic.

Problem

Welding process not in control (inconsistent weld results on a part-to-part basis).

Probable Cause	Solution
A mold release agent is used.	Clean the mating surfaces. If a mold release agent is necessary, use a paintable/printable grade.
Incorrect part tolerances.	Tighten the part tolerances. Check the part dimensions. Check the molding dimensions.
There are cavity-to-cavity variations.	Check the part dimensions and tolerances. Check for cavity wear. Check the molding conditions.

Welding

Problem

Welding process not in control (inconsistent weld results on a part-to-part basis) (continued).

Probable Cause	Solution
Part dimensions vary due to mold cavity variations.	Perform a statistical study to see if a pattern develops with certain cavity combinations.
The resin contains regrind or degraded plastic.	Consult with the molder. Check the molding conditions. Reduce the percentage of regrind. Improve the quality of the regrind.
Fluctuations in the AC line voltage supplied to the generator.	Upgrade to a generator with line regulation.
Fluctuations in the air line pressure.	Upgrade to a system with electronic pressure regulation. Add a surge tank with a check valve to the air line. Raise the compressor output pressure.
The plastic's filler content is too high.	Reduce the percentage of filler in the plastic. Check the processing conditions. Change the type of filler (e.g., from short to long glass fibers).
The horn doesn't fit the part correctly.	Check the part dimensions. Check for cavity-to-cavity variations. Obtain a new horn.
The weld cycle is too long.	Reduce the weld cycle time and increase the horn amplitude or air pressure. Increase the dynamic trigger force.
There is a lack of parallelism between the horn, part, and/or fixture.	Check for parallelism between the horn, part, and fixture. Check the horn/part fit. Check the part/fixture fit. Level the fixture, where necessary.
Rigid fixture reflects vibratory energy.	Dampen the energy by using teflon, neoprene, cork, or urethane in the nest of the fixture.

Insertion

Problem

The insert pulls out easily in use.

Probable Cause	Solution
There is insufficient interference between the hole and the insert.	Reduce the size of the molded hole in the plastic.
The screw bottoms out in the hole.	Use a shorter screw. (Applies to internally-threaded insert).
	Deepen the hole.
The insert gets pushed into the plastic before the plastic melts.	Use hydraulic speed control. Increase the horn amplitude and/or decrease the air pressure. Use pre-triggering.
The ultrasound remains on after insertion is complete.	Decrease the primary weld characteristic.
The horn retracts before the plastic around the insert is solidified.	Increase the hold time.

Problem

Inconsistent insertion of multiple inserts on the same part.

Probable Cause	Solution
The plastic is not melting consistently around all inserts.	Increase the horn amplitude.
Inserts are pushed into the plastic before the plastic has melted.	Use hydraulic speed control. Reduce the down speed. Use pre-triggering.
Inserts are seated at different heights within the same part.	Evaluate the support provided by the fixture. If required, re-level or shim the fixture.
	Measure the horn tip length to check for dimensional consistency. If a varying length is found, send the horn to Dukane for modification.

Insertion

Problem

The boss or the plastic around the boss cracks after insertion.

Probable Cause	Solution
The insert is pushed in before the plastic has melted.	Reduce the down speed, air pressure, and/or horn amplitude. Use pre-triggering.
The gauge pressure is set too high.	Reduce the air pressure.
The boss wall is too thin.	Increase the thickness of the boss wall.
There is too much interference between the insert and the hole.	Increase the hole diameter. Use a smaller insert.

Problem

The insert is not driven to the desired depth.

Probable Cause	Solution
The ultrasound is not on long enough.	Increase the primary weld characteristic. Check the bottom stop setting.
Flash fills the hole. (Applies to an internally-threaded insert.)	Increase the depth of the hole.
There is insufficient air pressure and/or ultrasonic power.	Increase the air pressure, the ultrasonic power, or the horn amplitude.

Problem

The cycle time is too long.

Probable Cause	Solution
There is insufficient ultrasonic power or the generator overloads.	If using a power control, increase the power. Use a more powerful generator.
There is too much interference between the hole and the insert.	Increase the hole diameter, if possible. Use a smaller insert.
The area of the part being inserted is not being rigidly supported.	Support the part directly under the boss. Install a metal post directly under the part being inserted.
The down speed is slow.	Increase the down speed.

Insertion

Problem

Plastic flows over the top of the insert.

Probable Cause	Solution
The weld time is too long.	Decrease the primary weld characteristic.
The insert is being driven too deep.	Reset the bottom stop. Decrease the primary weld characteristic.
There is too much interference between the hole and the insert.	Increase the hole diameter, if possible. Use smaller inserts.

Problem

Melted plastic fills the hole (Applies to internally-threaded inserts).

Probable Cause	Solution
The insert is too long or the hole is too shallow.	Use a shorter insert or make the hole deeper.
There is too much interference between the hole and the insert.	Increase the hole diameter. Use smaller inserts.
The insert is being driven too deep.	Reset the bottom stop. Decrease the primary weld characteristic.

Staking

Problem

A ragged or irregularly shaped stake head is formed.

Probable Cause	Solution
The staking cavity is too large.	Change to a smaller cavity in the horn.
The volume of plastic in the stud is insufficient.	Increase the stud height/diameter.
The stud is melting at the base.	See the problem section that follows entitled "The base is melting before the head forms".

Problem

There is excessive flash around the stake head.

Probable Cause	Solution
The staking cavity is too small.	Use a larger cavity in the horn.
The volume of plastic in the stud is excessive.	Decrease the stud height and/or diameter.
The stud is not centered in the horn cavity.	Center the stud under the horn cavity.

Problem

The surface below the stake head is distorted.

Probable Cause	Solution
The part is not supported directly beneath the stud being staked.	Support the fixture with a metal post beneath the stud being staked.
The trigger force is too high.	Reduce the trigger force. Use pre-triggering.

Problem

There is a loose fit between the staked head and the part being attached.

Probable Cause	Solution
The hole diameter relative to	Reduce the hole diameter.

Staking

Problem

There is a loose fit between the staked head and the part being attached (continued).

Probable Cause	Solution
The holding force was removed before the stud head could solidify.	If using a dual pressure system, use Pressure 2 in the hold portion of the weld cycle (Pressure 2 should be higher than Pressure 1). Increase the hold time/distance. Increase the stud diameter. Reduce the size of the staking cavity.
Insufficient force is being applied to the staked head during the hold time.	Lower the bottom stop for the horn's travel.

Problem

The stud is collapsing at its base.

Probable Cause	Solution
There is a sharp corner near the base of the stud.	Radius the stud at the base.
The stud is not centered in the horn cavity.	Center the stud under the horn cavity. Use a knurled tip
The base is melting before the head forms.	See the problem section below entitled "The base is melting before the head forms".
Too much pressure is applied before the ultrasound is activated.	Use pre-triggering.

Problem

The base is melting before the head forms.

Probable Cause	Solution
The trigger force is too high.	Reduce the trigger force. Pre-trigger the ultrasound.
The horn amplitude is insufficient.	Increase the amplitude.
The downstroke speed is too fast.	Use hydraulic speed control. Use a slower downstroke speed.

Staking

Problem

The formed stud head stays in the staking cavity as the horn retracts.

Probable Cause	Solution
The stud head has not solidified before the horn retracts.	Increase the hold time.
The horn tip is heating and not allowing the stud to solidify.	Cool the horn tip. Use afterburst.

Note: The use of a knurled horn tip and a pointed stud can help solve many of the above problems.

Continous Welding

Problem

Seal not meeting strength requirements.

Probable Cause	Solution
Material traveling too quickly.	Decrease speed.
Not enough horn amplitude.	Increase booster ratio.
Inconsistent blends of synthetic material.	Evaluate material.

Problem

Inconsistent welding.

Probable Cause	Solution
Nonuniform amplitude horn.	Have horn analyzed for amplitude uniformity.
Variations in anvil (fixture).	Check fixture design and dimensions.
Inconsistency of material.	Evaluate material.

Problem

Seal area too great, causing flash.

Probable Cause	Solution
Material traveling too slow.	Increase speed.
Too much amplitude.	Reduce booster ratio.
Excessive air pressure.	Reduce air pressure.

Problem

Transducer and/or horn heating up.

Probable Cause	Solution
Not enough air flow to dissipate heat buildup applications). Supply air to the stack	Continuous duty applications requires cooling air (refrigerated air, in some interfaces and the horn tips.

Continous Welding

Problem

Excessive horn wear.

Probable Cause	Solution
Metal-to-metal contact between the horn and anvil.	Use carbide inserts or have horn face carbide-coated. Reduce metal-to-metal contact

Problem

Overloading generators.

Probable Cause	Solution
Loose stack components.	Disassemble, clean and reassemble stack.
Horn failure.	Replace horn.
Transducer failure	Replace transducer
Booster failure.	Replace booster.
Stack operating frequency shifted out of tolerance.	Cool stack with air.

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SECTION 9

Service/Maintenance

- This section provides instructions for periodic servicing of the press/thruster.

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Six Month Periodic Maintenance

1. Disconnect the generator AC power cord from the AC line receptacle. Then, remove the thruster left and right side covers.

2. Check that all socket-head cap screws in the press/thruster are tight. Check the air cylinder mounting.

3. Wipe or blow away all dirt and grease in the press/thruster.

4. Wipe away all excess oil and any dirt accumulation, especially at the exhaust openings in the transducer housing. There should be very little, if any, oil accumulation at the air exhaust opening. We recommend that no oil get into the press/thruster pneumatics. Regular accumulation of oil at the air exhaust opening means that some oil is getting into the pneumatics. To rectify this problem, route the air for the press/thruster through an "oil mist reclassifier".

5. Check the press/thruster slide operation for smooth downward motion. Wipe away any accumulated grease, but do not apply any solvents. If movement is not smooth, the lower bearing may be greased with AFB lithium grease in the standard grease fitting provided.

6. Ensure that all wire and cable connections are secure in the press/thruster and are not rubbing or showing wear. If they do show wear or rubbing then reroute to eliminate the problem.

7. Remount and secure the press/thruster covers and reconnect the generator AC power cord to the AC line receptacle.

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SECTION 10

Contact Dukane/Warranty

- This section provides information on factory support, spare parts and warranty data.

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Contacting Dukane

Identify Equipment

When contacting Dukane about a service–related problem, be prepared to give the following information:

- Model number, line voltage and serial number.
- Alarm messages from the touch screen display.
- Problem description and steps taken to resolve it.

Many problems can be solved over the telephone, so it is best to call from a telephone located near the equipment.

Intelligent Assembly Solutions

Mailing Address: Dukane Ultrasonics
2900 Dukane Drive
St. Charles, IL 60174 USA

Phone: (630) 797–4900

Fax:
Main (630) 797–4949

Service & Parts (630) 584–0796

Website

www.dukane.com/us

The website has information about our products, processes, solutions, and technical data. Downloads are available for many kinds of literature.

You can locate your local representative at:

www.dukane.com/us/sales/intsales.htm

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Replacement Parts List	
Description	Part #
Air cylinder 1-1/2" dia. x 7" (30/40K)	804-66
Air cylinder 2-1/2" dia. x 7"	804-33
Air cylinder 9/16" dia. x 11"	804-63
Air exhaust muffler 10-32	804-64
Air pressure gauge	486-4
Air pressure regulator	804-52
Bottom stop Knob	440-415
Check valve	804-36
Dual Pressure solenoid valve	804-37
Door O-Ring retainer (30/40K)	340-92
DPC interface PCB	110-3487
Exhaust muffler	804-16
Fitting, 1/4 NPT x 1/4 PL elbow	295-82
Fitting, 1/8 NPT x 1/4 PL elbow	295-95
Fitting, 1/8 NPT x 1/4 PL straight	295-79
Fitting, 1/4 PL "Y"	295-126
Flow control	736-17
Flow control (30/40K)	736-20
Grease packet, high pressure	474-33
Hex key tool, 5mm	721-31-00056
Hinge, Rear (30/40K)	370-237
Hinge, Front (30/40K)	370-204
Hinge, 370-127 fin appld	370-27TA
Hinge, 370-128 fin appld	370-28TA
Label, press door caution	455-943
LED retainer	599-50
LED trigger PCB	110-2985
Linear slide bearing	137-87
Microswitch	680-403
1/4 Turn Fastener Retainer	599-66
1/4 Turn Fastener Stud	670-363
PCB, LED board	110-2985
PCB, press/thruster I/O board	110-3487
Receptacle, high voltage BNC	597-345
Receptacle, 1/4 Turn fastener	597-346
Spring green trigger	650-529
Toggle switch	680-897
Tool wrench (30/40K)	721-44
Tool door wrench (30/40K)	721-31-00011
Top of stroke shock absorber	568-24
Transducer, heavy-duty	110-3122B or 110-3122A
Transducer, 40K	110-3429
Transducer, 30K	110-3815
Trigger Knob	228-32
Tubing, clear 1/8" OD bulk length	716-55
Tubing, rigid polyflo 1/4" OD bulk length	716-38
Tubing, polyurethane	716-66
Valve, Dbl Sol SMC NVFS20	736-19
Wrench HD spanner	721-68

Note: All parts fit 220 & 340 presses, unless noted.

DUKANE CORPORATION

NORTH AMERICAN WARRANTY POLICY

Subject to the terms, limitations and exclusions set forth below, Dukane Corporation IAS Division (Dukane) warrants to the original Purchaser, unless otherwise expressly agreed to in writing by Dukane, that all equipment and tooling designed and built by Dukane will be free from defects in material or workmanship. Normal wear items are not covered by this warranty. Warranty duration shall be defined as documented herein and in conjunction with any exceptions or exclusions in the accompanying Dukane quotation to the Purchaser.

Equipment Type	Equipment Warranty Duration	Other Comments
Custom Systems	12 months on all Dukane designed and built content that is not part of our standard product.	Dukane standard product included in custom systems are covered by the applicable product warranty.
Hot Plate Welder	24 months	none
Laser Welder	For all laser sources, Original equipment manufacturer (OEM) warranty is applicable.	All internal laser optics and external beam delivery optics are warranted for only 30 days.
Spin Welder	24 months	none
Thermal Press	24 months	none
Ultrasonic Welder	36 months	See WARRANTY EXCLUSIONS OR EXCEPTIONS below.
Vibration Welder	24 months	none
All Production Tooling	12 months, one-time replacement. (6-month, one-time replacement for carbide tipped horns)	none
Prototype Tooling	• All tooling made from Renshape 460 (Renwood) are only warranted for 200 part-cycles. • All other prototype tooling is warranted as described in each specific proposal.	Prototype Renshape 460 (Renwood) tools employ reusable content, and therefore remain the property of Dukane.

All Dukane warranties commence on the date of the original shipment of the equipment or tooling, and duration is based upon a single shift per day, five day per week operation. The warranty period on rentals of new equipment that are converted to a purchase are deemed to have commenced on the initial date of rental.

These warranties are limited to equipment and tooling operated and maintained per Dukane's written instructions, and used under normal operating conditions. These warranties do not include normal wear or normal wear items, and do not cover damage attributable to misuse, improper installation, faulty repair, unauthorized alteration or modification, neglect, or accident. Misuse includes operation of equipment with tooling that is not qualified for the equipment or properly installed on the equipment.

The warranty on all Dukane equipment and tooling purchased and installed in North America is a parts and labor warranty only. Equipment installed outside of North America, regardless of where it was purchased, is covered by Dukane's International Warranty Policy. In all cases, when on-site service is required, Travel & Living (T&L) expenses will be billed at cost. Warranty service labor (including travel time) at the customer's site is provided on a Monday through Friday (excluding holidays), 7 a.m. to 7 p.m. basis. Any warranty service requested outside of these hours is available on a charge basis equal to 150% of Dukane's prevailing rate for technical service work.

Any equipment or tooling that proves to be defective in material or workmanship during the stated warranty period will be repaired or replaced at the sole discretion of Dukane Corporation when Dukane is promptly notified in writing. During the warranty period, defective equipment, components, or tooling that are returned properly packed with all transportation charges prepaid will be repaired or replaced and returned to the end-user without charge. Shipments of warranty parts will be via standard, non-expedited delivery service. Expedited shipment requests are subject to freight charges to the Purchaser.

Computers, PLCs, CRTs, LCDs, touch screens, and keyboards separate and/or incorporated as an integral part of a system will carry a one (1) year warranty from the date of shipment when used under normal operating conditions, and not subjected to misuse, abuse, or neglect. For all other equipment, components, or parts included in equipment or systems from Dukane, but not manufactured by Dukane or its affiliates, this warranty shall be limited in time and extent to the warranty given to Dukane by the OEM.

EQUIPMENT WARRANTY EXCLUSIONS OR EXCEPTIONS:
When specified in our quotation, a limited warranty may apply to certain components of the equipment, and/or for certain types of applications of the equipment, including those noted below.

- ❑ This warranty is void if the ultrasonic welder and/or tooling [i.e., horn(s) and fixture(s)] are used for applications requiring metal-to-metal contact, when the ultrasonic exposure period (weld cycle) exceeds 250 milliseconds.
- ❑ Ultrasonic Equipment and tooling used in continuous duty cycle modes such as, but not limited to, continuous cut and seal, and food processing are warranted for 2000 hours or 12 months from shipment, whichever occurs first.
- ❑ Any ultrasonic horn or tool quoted and sold as "Experimental" is not warranted.
- ❑ This warranty does not cover failures of equipment and components attributable to improper cooling or overheating of the transducer.
- ❑ Ultrasonic Horn Analyzers have a 12-month warranty.
- ❑ Ultrasonic Transducers have a one-time replacement warranty.
- ❑ Normal wear items and consumables excluded from any warranty coverage include, but are not limited to, filters, fuses, light bulbs, lubricants, gaskets and seals, cast urethane fixture components, laser flashlamps, laser beam delivery optics, and lasing gases.

The forgoing warranty is the sole and exclusive warranty and is made in lieu of all other warranties, express, implied or statutory, including without limitation any warranties of merchantability, fitness for a particular purpose, description, quality, productiveness or any other warranty. The remedy set forth in this warranty policy is the sole and exclusive remedy of Purchaser and in no event shall Dukane be liable for any compensatory, consequential, special, punitive or contingent damages or for damages arising from any delay in performance by Dukane under this warranty.

DUKANE CORPORATION INTERNATIONAL WARRANTY POLICY

Subject to the terms, limitations and exclusions set forth below, Dukane Corporation IAS Division (Dukane) warrants to the original Purchaser, unless otherwise expressly agreed to in writing by Dukane, that all equipment and tooling designed and built by Dukane will be free from defects in material or workmanship. Normal wear items are not covered by this warranty. Warranty duration shall be defined as documented herein and in conjunction with any exceptions or exclusions in the accompanying Dukane quotation to the Purchaser.

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Hot Plate Welder	12 months	none
Laser Welder	For all laser sources, Original equipment manufacturer (OEM) warranty is applicable.	All internal laser optics and external beam delivery optics are warranted for only 30 days.
Spin Welder	12 months	none
Thermal Press	12 months	none
Ultrasonic Welder	12 months	See WARRANTY EXCLUSIONS OR EXCEPTIONS below.
Vibration Welder	12 months	none
All Production Tooling	12 months, one-time replacement. (6-month, one-time replacement for carbide tipped horns)	none
Prototype Tooling	• All tooling made from Renshape 460 (Renwood) are only warranted for 200 part-cycles. • All other prototype tooling is warranted as described in each specific proposal.	Prototype Renshape 460 (Renwood) tools employ reusable content, and therefore remain the property of Dukane.

All Dukane warranties commence on the date of the original shipment of the equipment or tooling, and duration is based upon a single shift per day, five day per week operation. The warranty period on rentals of new equipment that are converted to a purchase are deemed to have commenced on the initial date of rental.

These warranties are limited to equipment and tooling operated and maintained per Dukane's written instructions, and used under normal operating conditions. These warranties do not include normal wear or normal wear items, and do not cover damage attributable to misuse, improper installation, faulty repair, unauthorized alteration or modification, neglect, or accident. Misuse includes operation of equipment with tooling that is not qualified for the equipment or properly installed on the equipment.

The warranty on all Dukane equipment and tooling purchased and installed in North America is a parts and labor warranty only. Equipment installed outside of North America, regardless of where it was purchased, is covered by Dukane's International Warranty Policy. In all cases, when on-site service is required, Travel & Living (T&L) expenses will be billed at cost. Warranty service labor (including travel time) at the customer's site is provided on a Monday through Friday (excluding holidays), 7 a.m. to 7 p.m. basis. Any warranty service requested outside of these hours is available on a charge basis equal to 150% of Dukane's prevailing rate for technical service work.

Any equipment or tooling that proves to be defective in material or workmanship during the stated warranty period will be repaired or replaced at the sole discretion of Dukane Corporation when Dukane is promptly notified in writing. During the warranty period, defective equipment, components, or tooling that are returned properly packed with all transportation charges prepaid will be repaired or replaced and returned to the end-user without charge. Shipments of warranty parts will be via standard, non-expedited delivery service. Expedited shipment requests are subject to freight charges to the Purchaser.

Computers, PLCs, CRTs, LCDs, touch screens, and keyboards separate and/or incorporated as an integral part of a system will carry a one (1) year warranty from the date of shipment when used under normal operating conditions, and not subjected to misuse, abuse, or neglect. For all other equipment, components, or parts included in equipment or systems from Dukane, but not manufactured by Dukane or its affiliates, this warranty shall be limited in time and extent to the warranty given to Dukane by the OEM.

EQUIPMENT WARRANTY EXCLUSIONS OR EXCEPTIONS:
When specified in our quotation, a limited warranty may apply to certain components of the equipment, and/or for certain types of applications of the equipment, including those noted below.

- ❑ This warranty is void if the ultrasonic welder and/or tooling [i.e., horn(s) and fixture(s)] are used for applications requiring metal-to-metal contact, when the ultrasonic exposure period (weld cycle) exceeds 250 milliseconds.
- ❑ Ultrasonic Equipment and tooling used in continuous duty cycle modes such as, but not limited to, continuous cut and seal, and food processing are warranted for 2000 hours or 12 months from shipment, whichever occurs first.
- ❑ Any ultrasonic horn or tool quoted and sold as "Experimental" is not warranted.
- ❑ This warranty does not cover failures of equipment and components attributable to improper cooling or overheating of the transducer.
- ❑ Ultrasonic Horn Analyzers have a 12-month warranty.
- ❑ Ultrasonic Transducers have a one-time replacement warranty.
- ❑ Normal wear items and consumables excluded from any warranty coverage include, but are not limited to, filters, fuses, light bulbs, lubricants, gaskets and seals, cast urethane fixture components, laser flashlamps, laser beam delivery optics, and lasing gases.

The forgoing warranty is the sole and exclusive warranty and is made in lieu of all other warranties, express, implied or statutory, including without limitation any warranties of merchantability, fitness for a particular purpose, description, quality, productiveness or any other warranty. The remedy set forth in this warranty policy is the sole and exclusive remedy of Purchaser and in no event shall Dukane be liable for any compensatory, consequential, special, punitive or contingent damages or for damages arising from any delay in performance by Dukane under this warranty.

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SECTION 11

Specifications

- This section contains a summary of the required components, power requirements and space require-

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Frequency Regulations

The ultrasonic system and the equipment installation described in this manual are covered by various FCC and State regulations and local codes. It also meets the various international regulations. Modifications must not be made to the generator or associated cables as such actions may result in violation of one or more of the regulations under which this equipment is manufactured.

System Equipment

The following equipment components are standard items in each of the systems shown in **Table 11-1**. In addition to the equipment shown, a horn and fixture are required for each application for which a system is used. Horns and fixtures are usually custom made for each application.

Items	Thruster	Press System	Remarks
Thruster	Yes	Yes	
Dynamic Process Controller	Yes	Yes	See Table 1–II for applicable generator
Transducer	Yes	Yes	
Booster	Yes	Yes	
Cables	Yes	Yes	
Spanner Wrench	Yes	Yes	
Hex Key tool	Yes	Yes	
User Manual	Yes	Yes	
Packet High Pressure Grease	Yes	Yes	
Ergonomic Base	No	Yes	
Support Package	No	Yes	

Table 11-1 *System Requirements*

Options

- Adjustable Thruster Mount
- Air Cylinders with diameters of 1.5 inch (38 mm), 2 inch (51 mm), and 3 inch (76 mm)
- Chrome-plated Column, 48 inch (1,219 mm)
- Electronic Pressure Regulator
- Force Transducer (Load cell)
- Hydraulic Speed Control
- Linear Optical Position Encoder

System Requirements

Pneumatic Power Requirements

The 220/340 Thruster requires 80-110 psi of clean, dry air.

Maximum available clamping pressure is 540 lbs @ 110 psi with a standard 63.5 mm diameter (2.5 inch Dia.) air cylinder.

Electrical Requirements

The press/thruster uses 24 VDC @ 2 Amps, obtained from the DPC/generator. The required AC line voltage and current depend on the selected DPC/generator, as shown in **Table 11-2**. The ultrasonic welding capability is determined by the generator installed in the Dynamic Process Controller (DPC).

Frequency	Generator Model	Peak Power Rating (Watts)	Nominal Input Power Requirements	AC Outlet Current Rating
20 kHz	2050	500	95–130V 50/60 Hz @ 8 Amps	15 Amps
			190–260V 50/60 Hz @ 4 Amps	15 Amps
	2120	1200	95–130V 50/60 Hz @ 15 Amps	15 Amps
			190–260V 50/60 Hz @ 8 Amps	15 Amps
	2170	1700	190–260V 50/60 Hz @ 12 Amps	15 Amps
	2220	2200	190–260V 50/60 Hz @ 15 Amps	15 Amps
	2300	3000	190–260V 50/60 Hz @ 15 Amps	15 Amps
30 kHz	3150	1500	190–260V 50/60 Hz @ 25 Amps	30 Amps
40 kHz	4035	350	95–130V 50/60 Hz @ 6 Amps	15 Amps
			190–260V 50/60 Hz @ 4 Amps	15 Amps
	4070	700	95–130V 50/60 Hz @ 12 Amps	15 Amps
			190–260V 50/60 Hz @ 8 Amps	15 Amps
	4100	1000	95–130V 50/60 Hz @ 15 Amps	15 Amps
			190–260V 50/60 Hz @ 8 Amps	15 Amps

Table 11-2 *Generator Model Listing*

Dimensions

For the dimensions and weight of the press and thruster, refer to **Table 11-3** and **Figure 11-1**.

Space Requirements:

The space for the press/thruster should not be less than the dimensions of the base width and depth listed in **Table 11-3**. Allow 4 inches (100 mm) behind the press/thruster for the air input line and the cable connections. This makes the minimum space requirements for a press installed on the base 18.6 (47 cm) inches wide and about 28.8 inches (73 cm) deep.

Figure 1-1 Model 220/340 Press Specifications

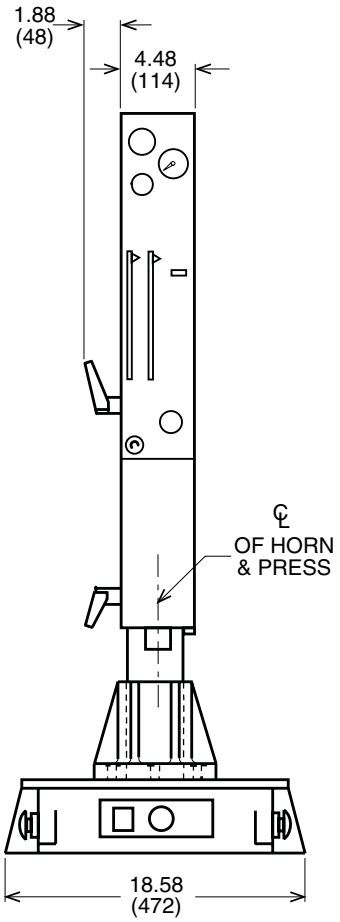

Figure 11-1(a) *Front View of Press*

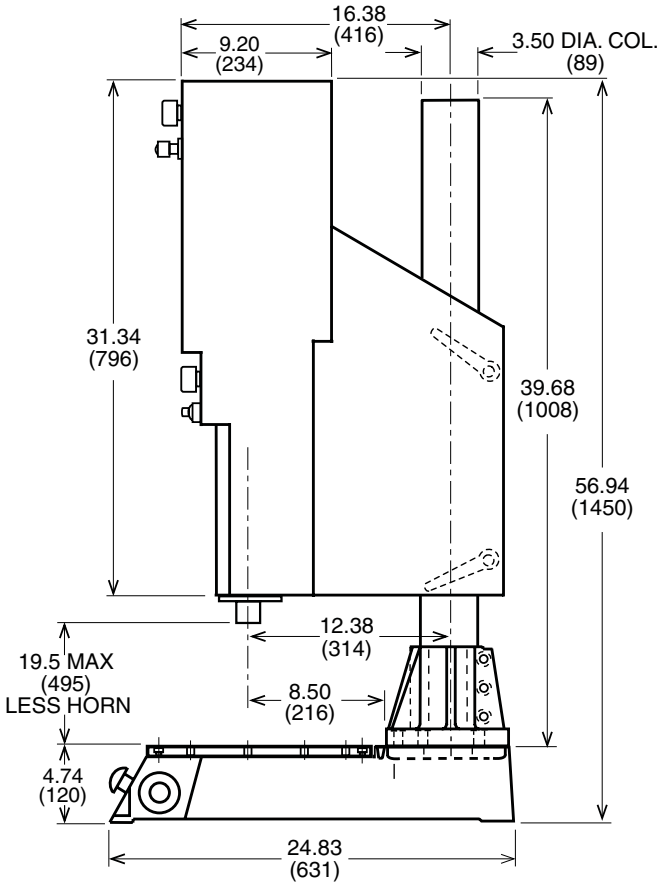

Figure 11-1(b) *Side View of Press*

Items	Height Inches (mm)	Width/Dia Inches (mm)	Depth Inches (mm)	Weight lbs (Kg)	Misc. Inches (mm)
Thruster Only	31.34 (796)	4.48 (114)	9.20 (234)	45 (20)	
Base	4.74 (120)	18.58 (472)	24.83 (631)		
Column	39.68 (1008)	3.50 (89)			
Col C.L. to Horn C.L.					12.38 (314)
Usable Throat					8.50 (216)
Stroke					7.00 (178)
Press	56.94 (1450)			170 (77)	

Table 11-3 *System Specifications*

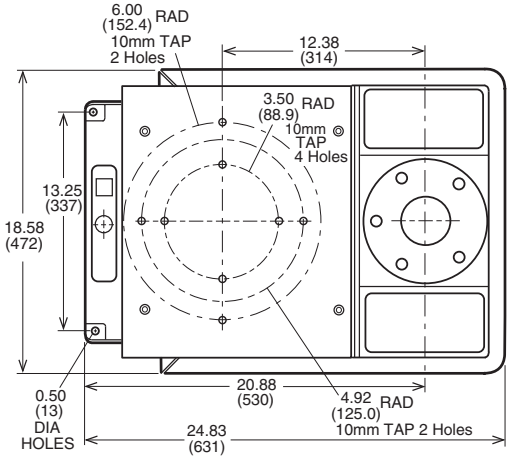

Figure 11-1(c) *Top View of Press*

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SECTION 12

Diagrams

- This section contains a system electrical schematic, a pneumatic layout and mechanical dimensions for the press/thruster system.

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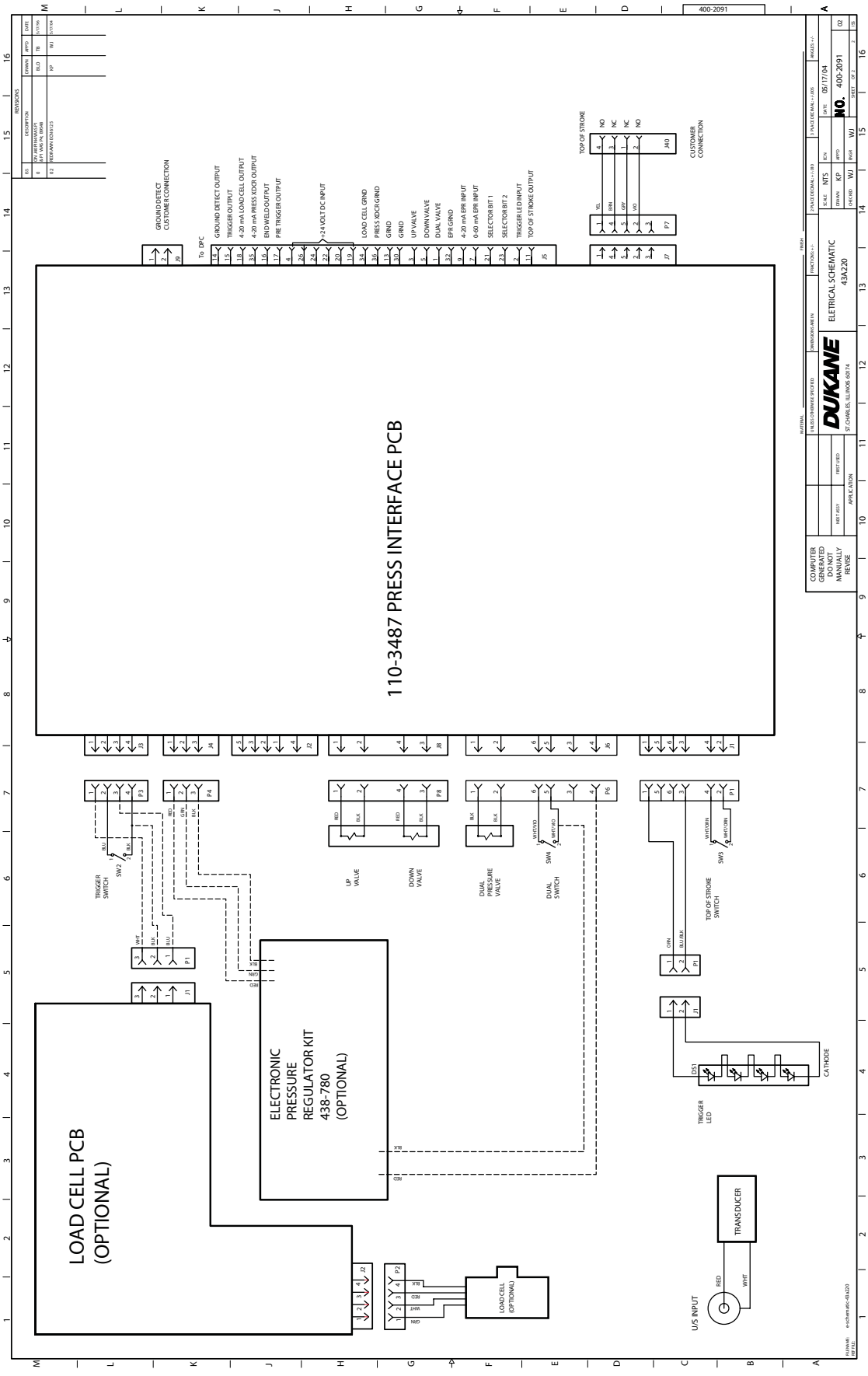
110-3487 PRESS INTERFACE PCB
LOAD CELL PCB (OPTIONAL)
ELECTRONIC PRESSURE REGULATOR KIT 438-780 (OPTIONAL)
LOAD CELL (OPTIONAL)
TRANSDUCER
U/S INPUT
TRIGGER LED
CATHODE
TRIGGER SWITCH
UP VALVE
DOWN VALVE
DUAL PRESSURE VALVE
DUAL SWITCH
TOP OF STROKE SWITCH
CUSTOMER CONNECTION
GROUND DETECT CUSTOMER CONNECTION
To DPC
GROUND DETECT OUTPUT
TRIGGER OUTPUT
4-20 mA LOAD CELL OUTPUT
4-20 mA PRESS XDCR OUTPUT
END WELD OUTPUT
PRE TRIGGER OUTPUT
+24 VOLT DC INPUT
LOAD CELL GRND
PRESS XDCR GRND
GRND
GRND
UP VALVE
DOWN VALVE
DUAL VALVE
EPR GRND
4-20 mA EPR INPUT
0-60 mA EPR INPUT
SELECTOR BIT 1
SELECTOR BIT 2
TRIGGER LED INPUT
TOP OF STROKE OUTPUT
TOP OF STROKE
ELECTRICAL SCHEMATIC 43A220
DUKANE
ST CHARLES, ILLINOIS 60174
400-2091
05/17/04
NTS
KP
WJ
02

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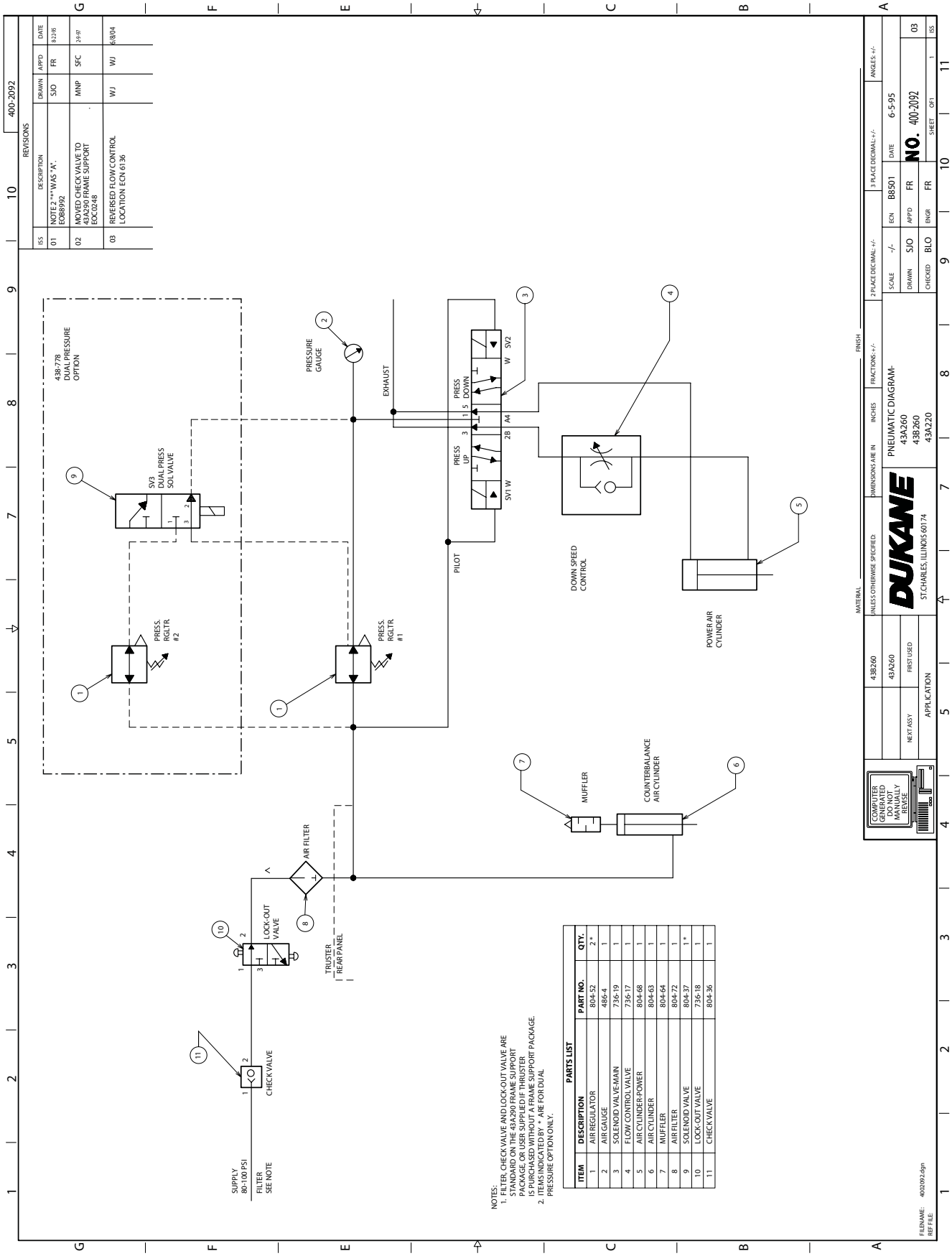
400-2092
REVISIONS
ISS DESCRIPTION DRAWN APP'D DATE
01 NOTE 2 "WAS "A". EO88992 SJO FR 8.23.95
02 MOVED CHECK VALVE TO 43A290 FRAME SUPPORT EOC0248 MNP SFC 2.9.97
03 REVERSED FLOW CONTROL LOCATION ECN 6136 WJ WJ 6/8/04
438-778 DUAL PRESSURE OPTION
SV3 DUAL PRESS SOL VALVE
PRESS. RGLTR. #2
PRESS. RGLTR. #1
PRESSURE GAUGE
EXHAUST
PRESS DOWN
PRESS UP
SV2
SV1
PILOT
DOWN SPEED CONTROL
POWER AIR CYLINDER
MUFFLER
COUNTERBALANCE AIR CYLINDER
AIR FILTER
LOCK-OUT VALVE
TRUSTER REAR PANEL
CHECK VALVE
SUPPLY 80-100 PSI
FILTER SEE NOTE
NOTES:
1. FILTER, CHECK VALVE AND LOCK-OUT VALVE ARE STANDARD ON THE 43A290 FRAME SUPPORT PACKAGE, OR USER SUPPLIED IF THRUSTER IS PURCHASED WITHOUT A FRAME SUPPORT PACKAGE.
2. ITEMS INDICATED BY " ARE FOR DUAL PRESSURE OPTION ONLY.
PARTS LIST
ITEM DESCRIPTION PART NO. QTY.
1 AIR REGULATOR 804-52 2*
2 AIR GAUGE 486-4 1
3 SOLENOID VALVE-MAIN 736-19 1
4 FLOW CONTROL VALVE 736-17 1
5 AIR CYLINDER-POWER 804-68 1
6 AIR CYLINDER 804-63 1
7 MUFFLER 804-64 1
8 AIR FILTER 804-72 1
9 SOLENOID VALVE 804-37 1*
10 LOCK-OUT VALVE 736-18 1
11 CHECK VALVE 804-36 1
COMPUTER GENERATED DO NOT MANUALLY REVISE
NEXT ASSY 43B260 43A260 FIRST USED
APPLICATION
MATERIAL
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FRACTIONS +/-
FINISH
2 PLACE DECIMAL +/-
3 PLACE DECIMAL +/-
ANGLES +/-
DUKANE
ST.CHARLES, ILLINOIS 60174
PNEUMATIC DIAGRAM-
43A260
43B260
43A220
SCALE -/- ECN B8501 DATE 6-5-95
DRAWN SJO APP'D FR
CHECKED BLO ENGR FR
NO. 400-2092
03
SHEET OF1 1 ISS
FILENAME: 4002092.dgn
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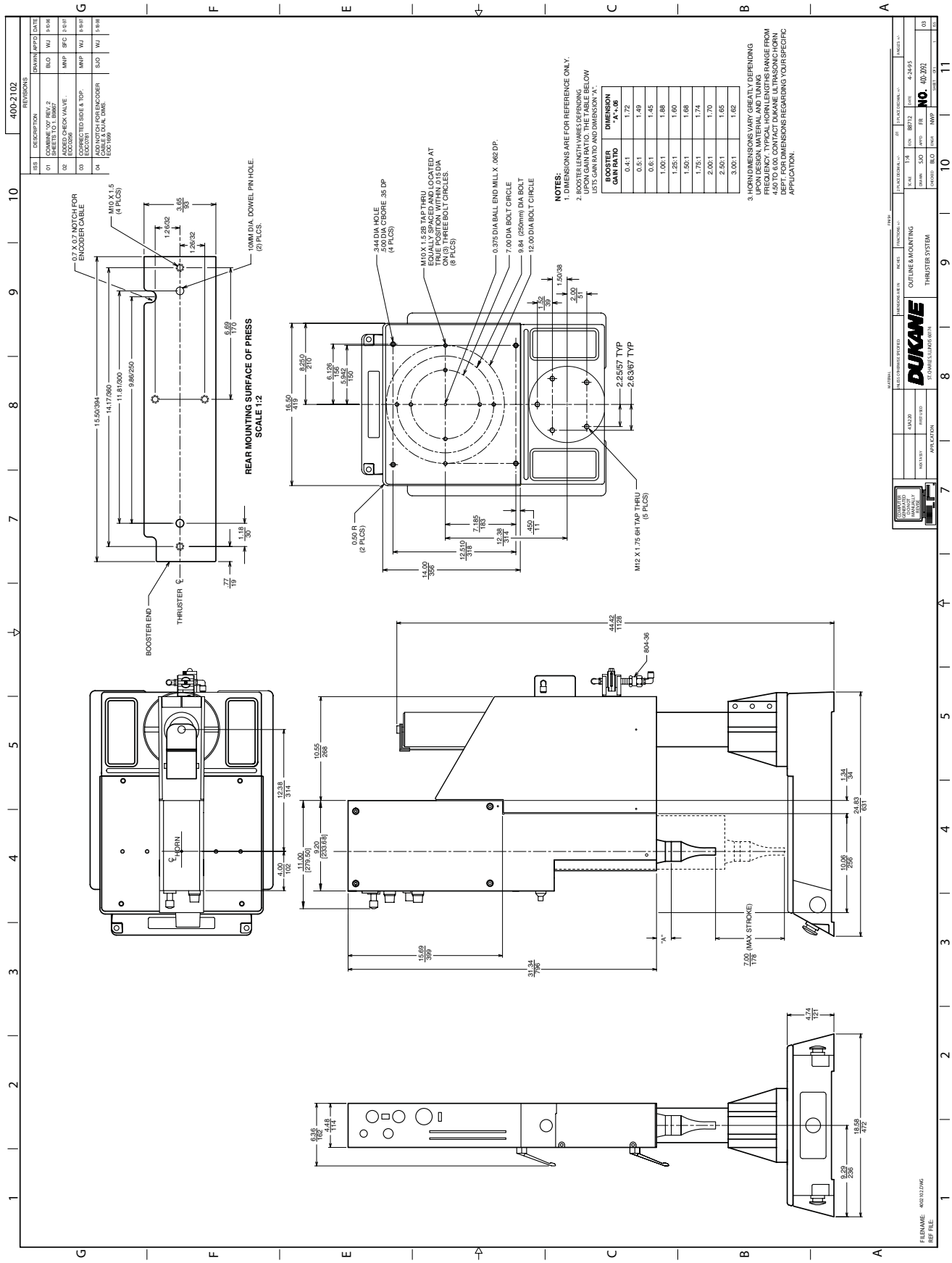
400-2102
REVISIONS
DESCRIPTION
DRAWN
APP'D
DATE
01 COMBINE 1ST REV. 2 SHEETS TO 1 ES967
02 ADDED CHECK VALVE EOC1258
03 CORRECTED SIDE & TOP. EOC1570
04 ADD NOTCH FOR ENCODER CABLE & DIA. DIMS. EOC 1699
REAR MOUNTING SURFACE OF PRESS
SCALE 1:2
BOOSTER END
THRUSTER
HORN
NOTES:
1. DIMENSIONS ARE FOR REFERENCE ONLY.
2. BOOSTER LENGTH VARIES DEPENDING UPON GAIN RATIO. THE TABLE BELOW LISTS GAIN RATIO AND DIMENSION 'A'.
BOOSTER GAIN RATIO
DIMENSION 'A' +.08
0.4:1 1.72
0.5:1 1.49
0.6:1 1.45
1.00:1 1.88
1.25:1 1.60
1.50:1 1.68
1.75:1 1.74
2.00:1 1.70
2.50:1 1.65
3.00:1 1.62
3. HORN DIMENSIONS VARY GREATLY DEPENDING UPON DESIGN, MATERIAL AND TUNING FREQUENCY. TYPICAL HORN DIAMETERS RANGE FROM 4.50 TO 6.00. CONTACT DUKANE ULTRASONICS HORN DEPT. FOR DIMENSIONS REGARDING YOUR SPECIFIC APPLICATION.
DUKANE
OUTLINE & MOUNTING
THRUSTER SYSTEM
NO. 400-2092
FILENAME: 400-102.DWG
REF FILE:

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SECTION 13

Glossary of Terms

- This section provides the definitions for terms used in this document.

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Amorphous Plastic — A thermoplastic which has a random molecular structure (e.g. ABS, Polycarbonate, Polystyrene).

Amplitude — The peak-to-peak excursion of a horn or a booster at its workface. It is usually measured in tens of microns or thousandths of an inch.

Booster — A mechanical transformer used to increase or decrease the amplitude of the horn vibrations.

Boss — The hollow stud into which an insert is driven.

Dampen — To mechanically limit the amplitude of vibration in the parts being assembled.

Degating — A process by which injection- molded plastic parts are removed from the runners and sprue at the gate.

Diaphragm Damage — Part flexing that can cause stress, fracturing, or undesirable melting of thin-sectioned, flat parts. Diaphragm damage is also referred to as "oil-canning," which describes the way the plastic part bends up and down when subjected to ultrasonic energy.

Digital Timer — A device used to accurately control the duration of a weld or a hold time by signaling the value to the acoustic stack assembly to extend and retract the horn and by activating the ultrasound for a predetermined time span.

Dual Pressure — A feature of Dukane ultrasonic assembly systems that allows the use of two different pressures during the assembly (welding, inserting, staking, etc.) process. Typically a weld is started at lower pressure and finished at a higher pressure.

Encoder — An electronic device that accurately measures distance or angle of rotation.

Energy Director — A triangular-shaped ridge of plastic molded into a part and typically running around the entire perimeter of a joint. When ultrasonic energy passes through the ridge, it concentrates the energy at the director's apex, resulting in rapid heat buildup, melting, and subsequent welding of the parts.

Far Field — Refers to the distance that ultrasonic energy is transmitted from the horn to the joint interface. When the joint is more than about 0.25 inch or 6mm from where the horn contacts the part, the weld is considered far field. (*see* **Near Field**).

Filler — An inert substance that is added to a resin to modify its physical characteristics.

Fixture	A device used to align and support the parts to be assembled. It is sometimes referred to as a *nest*.
Flash	The overflow of plastic from a welded joint area.
Frequency	The number of cycles per second measured in hertz (Hz).
Gain	The ratio of output amplitude to input amplitude of a horn or a booster. When the gain is greater than one, the output amplitude is larger than the input amplitude.
Gate	The area through which molten plastic flows into the mold cavity. *Also see* Degating.
Generator	An electronic device that converts standard 120/240 volt, 50/60 Hz line voltage into high-frequency electrical energy.
Hermetic Seal	An airtight and liquid–tight seal.
Hold Time	The length of time allotted for the melted plastic to solidify.
Horn	An acoustical tool designed to transfer mechanical vibrations from the transducer-booster assembly directly to the parts to be welded together.
Hygroscopicity	The tendency of some thermoplastic materials to absorb moisture from the air. Nylon is very hygroscopic.
Hz or **Hertz**	Cycles per second. Ultrasonic waves are measured in kHz or thousands of cycles per second.
Insert	A metal fastener designed to be installed in a plastic part.
Insertion	An ultrasonic assembly technique that embeds a metal insert into a plastic part.
Joint Design	Molding the shape of mating thermoplastic parts to achieve the intended assembly results. Proper joint designs provide a uniform contact area, a small initial contact area, and a means of aligning the mating halves to be welded together.
Load Cell	A transducer that measure applied force and coverts the force into an electric signal to allow precise force measurements.
Marking	Cosmetically scuffing or marring of plastic parts by the horn or the fixture.

Mold Release	A substance added to plastics so that parts are easily removed from the mold.
Near Field	Refers to the distance that ultrasonic energy is transmitted from the horn to the joint interface. When the joint is less than about 0.25 inch or 6mm from where the horn contacts the part, the weld is considered near field. (*see* **Far Field**).
Nodal Point	The point in a booster or horn where little or no linear motion (due to the ultrasonic wave) occurs.
Piezoelectric Material	A ceramic material that emits electrical charge when force is applied or changes dimension when electric energy is applied.
Pneumatic	Powered, operated, or controlled by compressed air.
Polymer	A chemical compound or mixture of compounds formed by a chemical reaction of two or more molecules. Polymers are also called resins.
Press	A pneumatically-operated device used to transport the acoustic stack assembly to the work in a controlled and repeatable manner. It is essentially a *thruster* mounted on a column, press support casting, and a base. (*Also see* Thruster.)
Regrind	Plastic material that has been recycled or reprocessed and added to the original resin.
Replaceable Tip	A machined titanium tip threaded to attach to a horn. Tips are commonly used in staking, swagging and spot welding assembly.
Resin	See Polymer.
Resin Grade	Refers to the classification of the physical and chemical properties of a resin.
Semi–Crystalline Plastic	A thermoplastic which has an orderly and repeated molecular structure (e.g. Nylon, Polyethylene, Polypropylene).
Shear Joint	A joint design formed by the controlled, telescoping melt of two contacting surfaces. A certain amount of interference must be designed into one of the mating parts to accomplish the weld.
Sound	Mechanical, radiant energy (vibrations) that is transmitted by longitudinal waves in a material medium, such as air, water, or metal.

Spot Welding	An ultrasonic assembly method where two thermoplastic components are joined at localized points. The components joined by spot welding are typically cast or extruded.
Staking	An ultrasonic assembly technique by which a plastic stud is formed into a rivet head to capture another part, which may be of a dissimilar material.
Stud	The plastic protrusion that is shaped into a rivet head to attach two parts together during staking.
Swagging	An ultrasonic assembly technique by which a ring or a ridge of plastic is formed by the horn face to capture another part.
Thermoplastic	A synthetic or manufactured material which softens when heated and harden when cooled. A thermoset plastic undergoes an irreversible change during processing and become permanently formed.
Titanium	A high–strength metal with good acoustic properties used in the manufacture of horns and boosters. The titanium used for horns and boosters is an alloy with enhanced properties.
Thruster	A pneumatically-operated device serving the same function as a *press*. A thruster can be mounted in a smaller area or otherwise nonstandard position. (*Also see* Press.)
Transducer	A piezoelectric device that converts high-frequency electrical energy into matching high-frequency mechanical vibrations.
Tuning	The process of matching the output frequency of the generator to the resonant frequency of the transducer-booster-horn assembly.
Ultrasound	Mechanical vibrations having the same physical nature as s*ound*, but with frequencies normally above the range of human hearing (above 20kHz).
Ultrasonic Sound	same as **Ultrasound**
Weld Time	The length of time the parts to be assembled are exposed to the ultrasonic energy.
Welding	An ultrasonic assembly technique that uses the heat of friction to bond thermoplastic parts.

SECTION 14

Index

- This section provides a quick, easy reference to names and terms covered in the manual.

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Dukane ISO

ISO CERTIFICATION

Dukane chose to become ISO 9001:2000 certified in order to demonstrate to our customers our continuing commitment to being a quality vendor. By passing its audit, Dukane can assure you that we have in place a well–defined and systematic approach to quality design, manufacturing, delivery and service. This certificate reinforces Dukane's status as a quality vendor of technology and products.

To achieve ISO 9001:2000 certification, you must prove to one of the quality system registrar groups that you meet three requirements:

1. Leadership
2. Involvement
3. Quality in Line Organizations and Quality System Infrastructure.

The ISO 9001:2000 standard establishes a minimum requirement for these requirements and starts transitioning the company from a traditional inspection–oriented quality system to one based on partnership for continuous improvement. This concept is key in that Dukane no longer focuses on inspection, but on individual processes.

Dukane's quality management system is based on the following three objectives:

1. Customer oriented quality. The aim is to improve customer satisfaction.
2. Quality is determined by people. The aim is to improve the internal organization and cooperation between staff members.
3. Quality is a continuous improvement. The aim is to continuously improve the internal organization and the competitive position.

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Dukane products are manufactured in ISO registered facilities

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www.dukane.com/us/sales/intsales.htm

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